Chemical Age

I.C.I. 5 M SEVERNSIDE PROJECT
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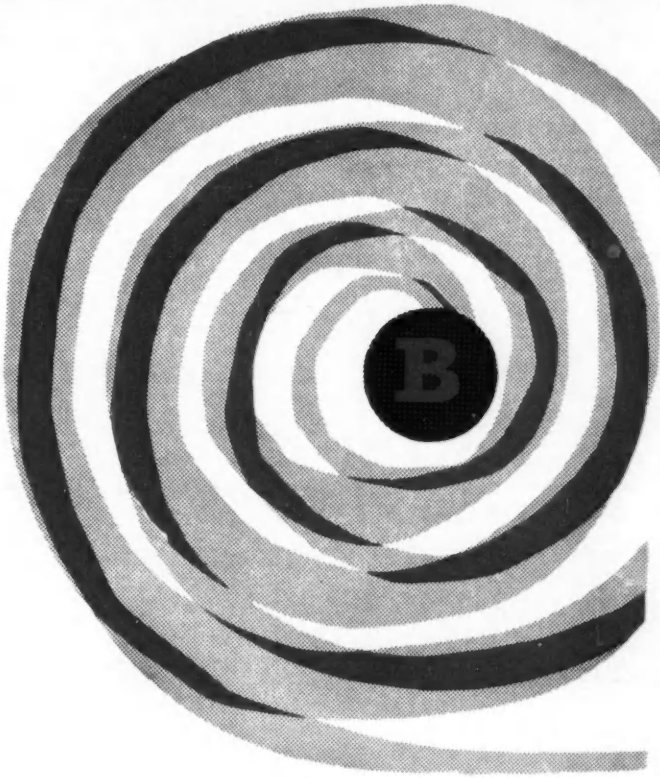

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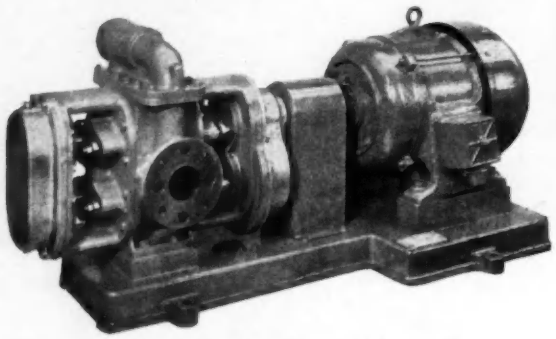

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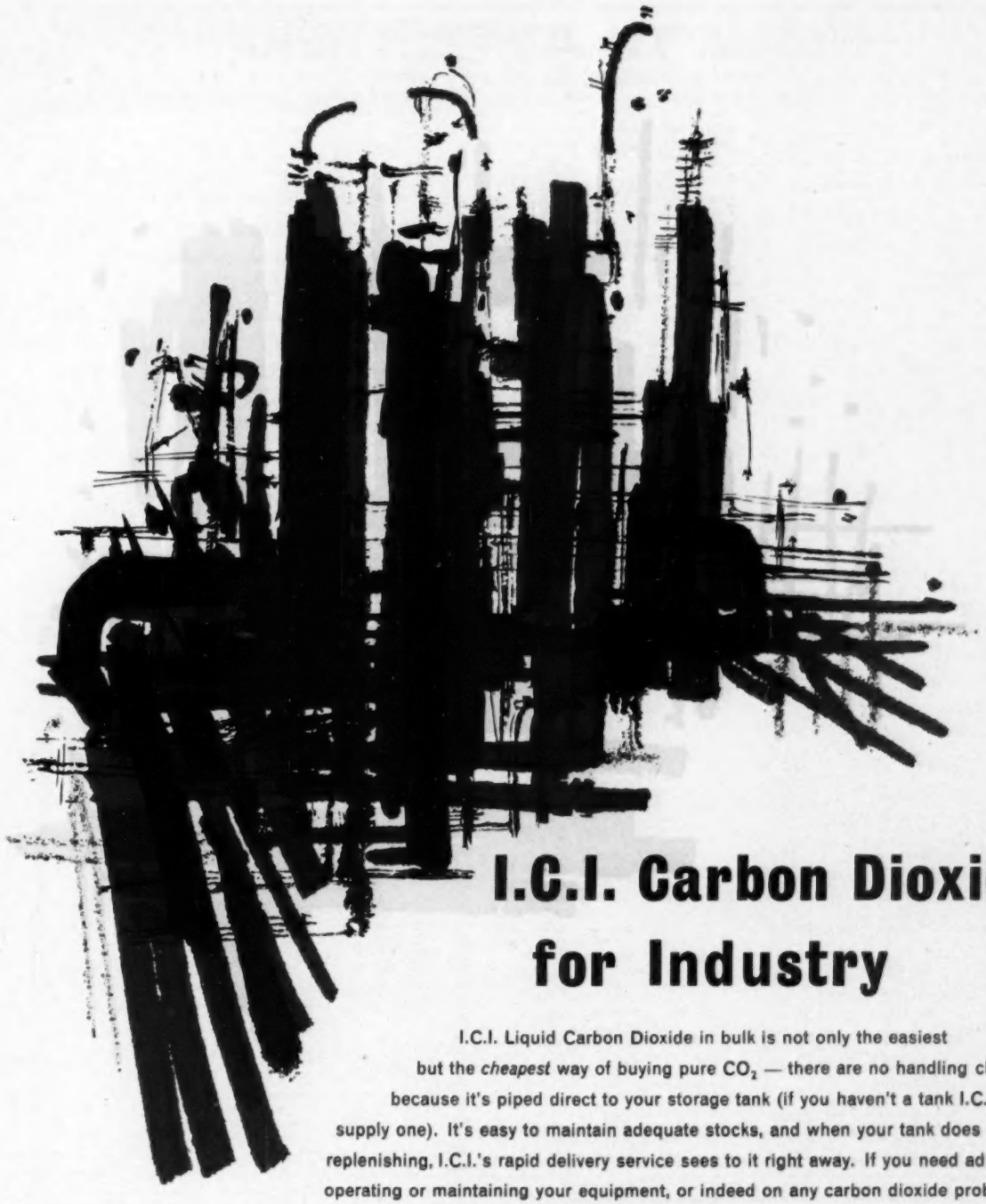

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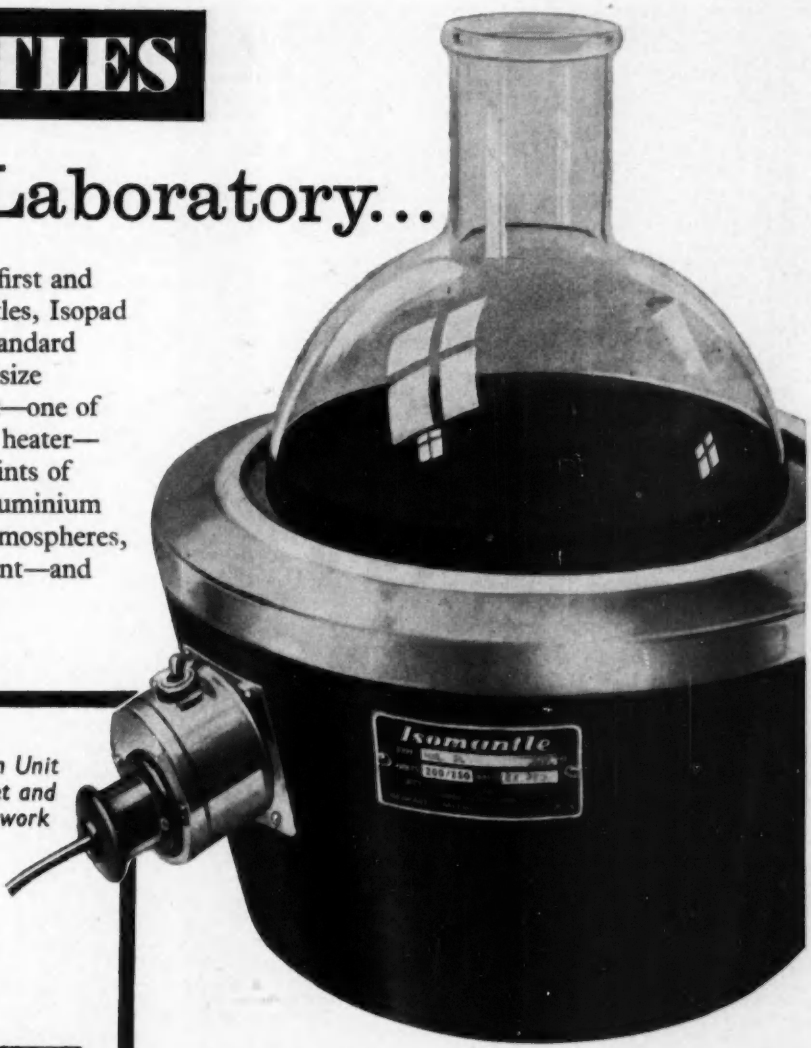

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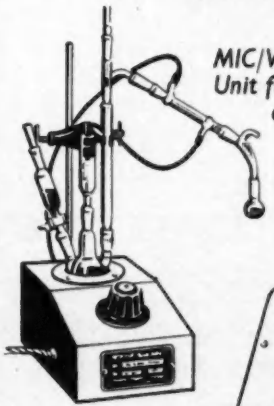

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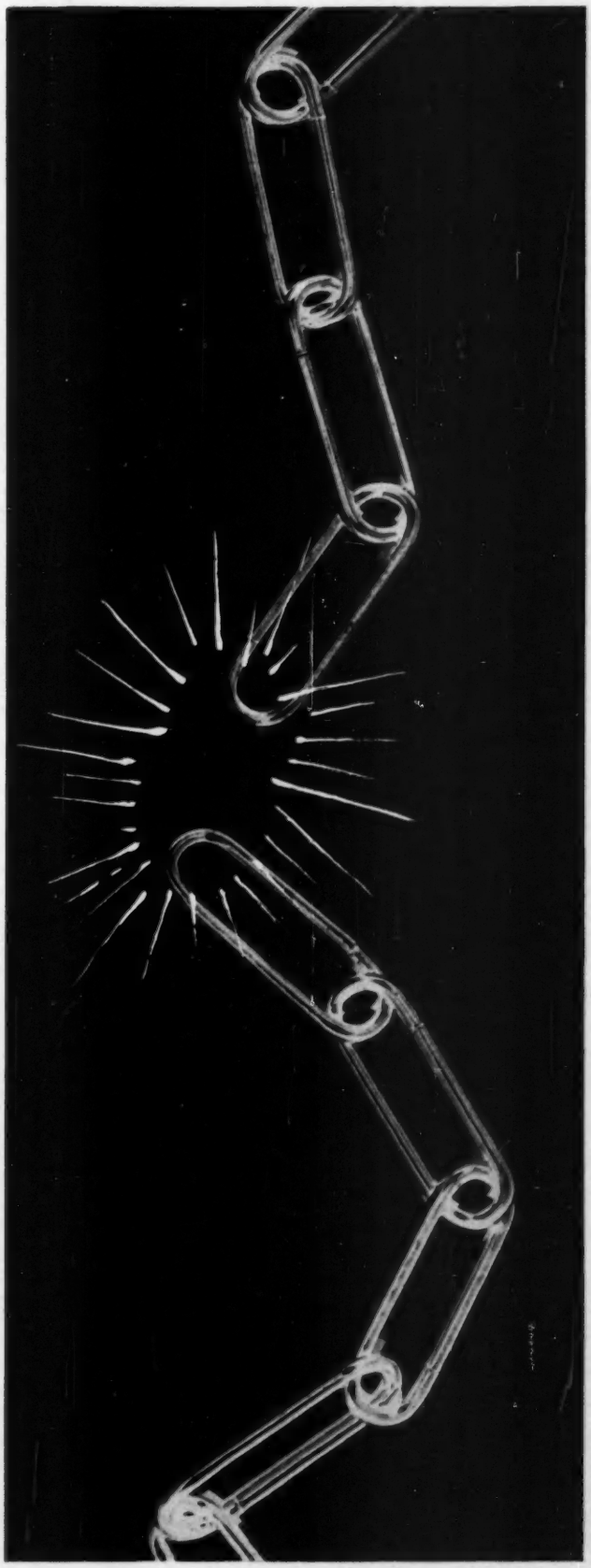

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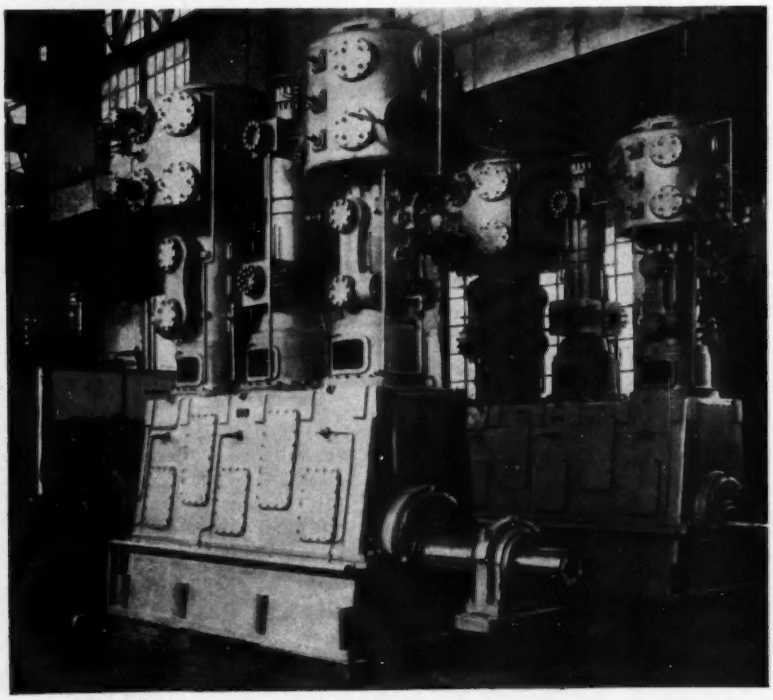

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CHEMICO

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FEBRUARY 20 1960

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CHEMICAL AGE

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THESE MERGERS

NOT quite two months of 1960 have passed but during this time three U.K. chemical and pharmaceutical companies have been concerned in take-over bids. In many quarters it is believed that further mergers will result. Reason advanced for the take-over bids is considered to be the stiffer competition now being met both at home and overseas.

First of the chemical companies to start-off the year with a take-over offer was Fisons. One of the leading U.K. fertiliser manufacturing companies, Fisons' first choice fell on Crosse and Blackwell, soups and canned foods producers. The reason behind this offer was obviously diversification. Nestlé, the original bidders for C. and B., made a second offer and acquired the company.

The next bid was that by Courtaulds, leading synthetic fibres manufacturers who have instituted a very active diversification policy since taking over British Celanese with interests in fibres and petrochemicals and Cellon with their paint interests. This bid, valued at £16.6 million in shares was for one of U.K.'s two largest paint producers, Pinchin Johnson (the other is Imperial Chemical Industries). Last December, Courtaulds signed a know-how agreement with Glidden International, subsidiary of Glidden Co., Cleveland, which gives them exclusive rights to use Glidden's development and manufacturing techniques and paint formulas in the U.K. Last week, Courtaulds had acquired over 88% of all shares of Pinchin Johnson and hence are now all set for a large section of Britain's growing paint market (CHEMICAL AGE, 13 February p. 296). With their experience with Cellon since 1958, Courtaulds feel that the association with Pinchin Johnson places them in a good position to play a major part in U.K. paint business particularly with regard to the motor car trade. It also rationalises even further British Celanese's petrochemical activities.

The middle of last month saw Aspro-Nicholas bidding for E. Griffiths Hughes and their associated companies which include British Schering and J. and C. Field (CHEMICAL AGE, 23 January, p. 162 and 175). Aspro-Nicholas Ltd., makers of branded aspirin, home disinfectants and starch products and a subsidiary of the Australian company, Nicholas Proprietories Ltd., who also own A. G. Nicholas of Delaware U.S., are offering £4.2 million in share exchange and cash. The offer has now been accepted by more than 91% of Griffiths Hughes stockholding.

Again widening of Aspro-Nicholas' sphere of operations will result from this take-over since Griffiths Hughes have interests in patent medicines and toilet goods and through British Schering Ltd., a recognised ethical pharmaceutical business and a useful entré into agricultural chemicals.

At the end of January, Albright and Wilson proposed a £4 million merger with A. Boake Roberts and Co. (Holding) Ltd. This bid can be regarded as an extension of A. and W.'s interests in plastics particularly in the plasticiser field. At present the company supplies the raw materials for these, while Boake Roberts already market a range of plasticisers.

Both companies have done well during the past few months, with Boake Roberts having shown a strong recovery since their setback in 1958-59, particularly in concentrating their efforts on certain products and putting up

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Both companies have done well during the past few months, with Boake Roberts having shown a strong recovery since their setback in 1958-59, particularly in concentrating their efforts on certain products and putting up

plant. Taking over Boake's will give A. and W., besides interests in synthetic aromatics, plasticisers, etc., additional phosphate facilities, for Boake Roberts have the largest tricresyl phosphate plant in the world with a capacity of 12,000 tons a year. This plant was the main outlet for A. and W.'s phosphorus oxychloride production.

Boake Roberts have agreements with certain U.S. companies. With Archer-Daniels-Midland, they exchange research information on epoxy resins. From Celanese Corporation of America they have a licence to make Cellulubes (phosphate-based lubricants) and then with Glidden Co., an agreement to exchange data on synthetic aromatics.

For their part A. and W. have an interest in Hooker Chemical through the merger of the A. and W. U.S. subsidiary, Oldbury Electrochemical, with Hooker, and there is an agreement between A. and W. and Dow Corning for the manufacture of silicones in Britain. A. and W. also have companies in Canada, Australia and South Africa and in Italy through their subsidiary, Marchon Products who are building a detergent raw materials plant in that country to supply the Common Market.

In the first week of this month Fisons made a £7.4 million bid for British Drug Houses Ltd., but no statement has been issued by the B.D.H. directors regarding their views on the offer. One of the reasons suggested for the delay is that the board is awaiting the up-to-date picture of trading results for 1959, B.D.H.'s year ended in December. Mr. Eley, B.D.H.'s chairman, is of course, an ex-banker and has guided several other companies through bids to these companies advantage. A point of interest about B.D.H. is that their property has not been valued since 1925. At this time the value placed on the company's properties, etc., was £1,006,000. Now 35 years later, a much higher value must be placed on them. The Fisons bid therefore appears to be on the low side.

At the time of the announcement of the Fisons' bid, speculation was rife as to which other company might make a counter-bid. Beecham, Glaxo and Aspro-Nicholas were all suggested. Of these three, the most likely is Beecham. Glaxo over a year ago merged with Allen and Hanbury, a company whose field of operations is closely allied to that of B.D.H. in many ways. Aspro-Nicholas, with their bid for E. Griffiths Hughes, can be ignored.

For some time now this journal has indicated that mergers between chemical, chemical and pharmaceutical, and pharmaceutical and pharmaceutical concerns was a must for eonomic survival and useful expansion. Competition both at home and overseas is a strong and valid reason for mergers, but in the recent cases in the chemical and pharmaceutical industries, diversification and widening of interests seems to be the main theme.

As we see it, those companies with interesting raw materials can have a closer tie with intermediate or end products. The companies with a limited range of interests can safeguard these by merging and the company active in the takeover becomes more suitably balanced. In some instances well-constructed research and development sections built up over some years, on their respective companies merging, should materially assist the future of both companies by a valuable exchange of ideas and knowledge; or the view can be taken that where one company has a strong research team but is limited for product or plant expansion, that company's team will be a valuable asset to the company with ideas, marketing know-how, etc.

The overseas aspects are also interesting. Export technique can be a valuable asset, especially to a company that has built up a strong position at home, but has few overseas activities. Most recent annual reports of the large chemical, pharmaceutical and allied concerns have laid stress on the fact that at least half of their profits have been derived from their overseas subsidiaries.

THE FERTILISER REPORT

AT long last the Monopolies Commission's report on the supply of chemical fertilisers has been published, and the findings of the Commission clear the leading fertiliser manufacturers—I.C.I., Fisons, British Basic Slag, S.A.I.—from any suggestion of using their 'monopoly' position against the public interest. There are two qualifications, however, one concerns Fison's pricing policy up to 1957 which is the final year the report covers, and some disquiet is felt about the importing company, Potash Ltd.

The Commission shows that Fisons' profits from fertilisers in the years from 1951 to 1957 averaged over 20% on capital employed and hence that prices must have been too high and this was against the public interest. Sir Clavering Fison, chairman of Fisons, decisively indicated that since 1957 his company had made reductions in fertiliser prices so that in 1957-58 the rate of profit was 19%, and in 1958-59 it was reduced to 17½%. Prices had been reduced by about an average of £1 15s to about £24 per ton, "due to the greater competition in the industry."

Fisons, while they have not acted in deliberate disregard of the public interests have fixed their prices at too high a level having regard to the strength of their position. The commission feels that Fisons' argument on the need to plough back profits is weakened by the fact that two-thirds of their company's new investment is in non-fertiliser business. The impression gained, however, is that in the years from 1951 to 1955, Fisons feared the fertiliser activities of I.C.I. and the large resources of that company.

It is interesting to note that I.C.I. are shown to have made a profit nearer to the average (16%) on their fertiliser trade in the years to 1957.

The Commission finds that neither I.C.I.'s monopoly in nitrogenous fertilisers, which is in fact rapidly diminishing with the coming into operation of new nitrogen-producing plants, nor the use they have made of their position has been against the public interest. The report does not feel the same about the agreement on sulphate of ammonia to which I.C.I. are a party and it seems that this may come within the province of the Restrictive Practices Act.

The other main recommendation was that additional methods of strengthening the bargaining power of potash consumers should be sought. Potash Ltd. are apparently controlled through nominees by French and West German potash producers and are "part of an international organisation designed to eliminate competition." The Commission stress that everything possible should be done to develop alternative sources of potash supplies and it suggests trading with Canada, the U.S., the U.S.S.R. and Israel. Potash Ltd. have no knowledge of production costs, the report reveals, and the Commission has no means of determining whether the price at which the company sells potash is reasonable in relation to the costs of all or any of the producers. The effects, in recent years, of competition from East Germany are such as to suggest that a greater degree of competition between Potash Ltd.'s suppliers would be beneficial to U.K. buyers. One member of the Commission, however, dissents from this criticism (see p. 320).

Another dissentient from part of the main report is economist Professor G. C. Allen, who considers the present practice in some cases of equalising transport charges undesirable. He suggests that the public interest would be served if the English were to follow the Scottish example and trade in fertilisers on an ex-works price basis (see p. 320). This dissent leaves open a question on economics which the companies and the Government, after examining the report, could well study. Sir Clavering indicated that his company agreed wholeheartedly with Professor Allen's views and is examining this question.

Project News

New Tonnage Oxygen Plants by B.O.G.

● ADDITIONAL tonnage oxygen plants in several steelworks have been announced by British Oxygen Gases, designed to produce about 1,500 tons of gaseous oxygen a day and doubling present supplies to the steel industry.

Both the Steel Company of Wales and Consett Iron are among the companies receiving increased tonnage, those named to the extent of an extra 200 tons/day. New tonnage plants will also supply 400 tons/day to steelworks belonging to Richard Thomas and Baldwins, and Colvilles.

All the new plants are to be the property of British Oxygen Gases and will be staffed by the company. Many are stated to be additions to existing plant, and are scheduled for operation before the year-end.

● A CONTRACT for the design, engineering and construction of a 5,000 tonnes/year phthalic anhydride plant has been awarded to Badger N.V., The Hague, a wholly owned subsidiary of Badger Manufacturing Co., Cambridge, Mass., by Union Chimique Belge S.A., Brussels.

The new phthalic plant will be constructed at Schoonarde at an estimated cost of $2 million. This is the second European phthalic anhydride project awarded to Badger during 1959.

● AN order worth £720,000 has been obtained by Lodge Cottrell of Birmingham, for plant equipment at the new Richard Thomas and Baldwins integrated strip mills at Newport. This contract is the largest single order ever secured by the company and is for blast furnace clearing plant at the new R.T.B. Spencer works. The plant will consist of gas-cooling and scrubbing towers, electrostatic precipitators, and water clarifying and filtration and dust recovery plants.

● P.G. ENGINEERING LTD., Stockton-on-Tees, have received an order from India for a plant to produce 150 lb. per hour of liquid carbon dioxide. The raw material will be fuel oil and the plant will be installed in Kerala State, South India.

Proposed Survey of Agricultural Pesticides

A MARKET and economic survey of agricultural pesticides to be carried out by Robert S. First Incorporated, of New York, will have among its objectives determination of the major producers of such pesticides, their market share and plant location: estimated market and end-use for 1960, 1965 and 1970; major consumers, their specifications and suppliers.

In addition the survey will investigate new products and researches in progress, and what are the research needs of the industry. An explanatory brochure is available from either of the sponsors: R. S. First, 60 East 42nd Street, New York 17; or Mr. O. W. Roskill, 14 Great College Street, Westminster, S.W.1.

Ethylene Oxide will be I.C.I.'s First Severnside Plant with . . .

CONSTRUCTION of I.C.I.'s first plants on their new 1,000-acre site in South Gloucestershire, three miles north of Avonmouth—for ethylene oxide, ethylene glycol and associated products—will start in the spring and will be supervised by I.C.I. staff.

The plants are expected to start production early in 1962. First stage of construction on the site, which will be known as Severnside Works, will involve spending about £5 million on initial site development and on the construction of plants for making 35,000 tons a year of ethylene oxide, ethylene glycol and associated products. Ethylene, the main raw material, will be supplied by an £800,000 pipeline by Esso Petroleum Co. Ltd., whose capacity at Fawley now totals 40,000 tons a year, and which is to be increased next year by a new £5.5 million project—announced this week.

This decision to go outside their own organisation for supplies of ethylene marks a major departure from I.C.I. policy so far as petrochemical products are concerned.

Ethylene oxide will be made by the air oxidation process developed by Scientific Design Company Inc., who will also design the plant. The plants for ethylene glycol and associated products will be designed by I.C.I.'s own engineering staff.

The initial site development and provision of services will be in accordance with plans made since 1957, when I.C.I. first announced their long-term intention to develop a large chemical factory on Severnside. The general pattern of development of this works is expected to resemble in many respects that of I.C.I.'s Wilton Works in North Yorkshire, where more than £100 million has been spent since 1949 and where investment in new plants still continues at a high level.

Growth in I.C.I.'s demand for ethylene, used principally in making Alkathene polythene and ethylene glycol, used in making Terylene polyester fibre, is continuing so strongly that ethylene output at Wilton is being expanded as quickly as possible in addition to the arrangement to draw supplies from Esso Petroleum Co.

When these plans come into effect, I.C.I.'s ethylene supplies in the U.K. will total 180,000 tons a year in addition to the substantial quantities made overseas by plants of subsidiary companies in Canada, Australia and India. There will be corresponding increases in the output of associated products at Wilton, including propylene and butadiene, and in the output of plants using these olefins.

U.K. capacity for ethylene oxide at the beginning of this year was for 65,000 tons; in 1959 18% of U.K. capacity for ethylene went to ethylene oxide. Apart from I.C.I.'s ethylene oxide and ethylene glycol facilities at Wilton, Union Carbide produce about 22,500 tons a year of ethylene oxide derivatives at their new £3 million Fawley plant, using their own process for the direct oxidation of ethylene. In addition, Shell Chemical were due on stream at the same time—end of 1959—with their new 25,000 tons-a-year direct oxidation ethylene oxide plant at Carrington. Their old chlorhydrin ethylene oxide plant is to be used for propylene oxide. U.K. ethylene capacity now totals 300,000 tons.

. . . Ethylene Piped from Extended Esso Facilities at Fawley Refinery

AN £800,000 pipeline will link Esso Petroleum Co.'s refinery at Fawley with Imperial Chemical Industries £5 million Severnside projects. To this purpose Esso have concluded an agreement with I.C.I. for the supply of ethylene direct from the Fawley refinery to I.C.I.'s Severnside works.

Esso also announce that in order to supply ethylene to I.C.I. at Severnside and to meet increasing demands for other additional feedstocks the £10 million chemical plant at Esso's Fawley refinery, which was opened by Lord Mills in December 1958 when he was Minister of Power, will be expanded. This expansion will involve an additional capital investment of £5½ million. Construction of this new plant which will include another steam cracker is expected to start soon and be completed by next year.

With regard to the pipeline, permission is now being sought from the appropriate authorities to lay the pipeline between Fawley and Severnside. The pipeline will be the first of its kind in Great Britain to link physically an oil refinery and a large chemical plant more than 70 miles apart for the direct supply of intermediate raw materials.

The pipeline will be buried to a minimum depth of 2 ft. 6 in. and its route will cross several railways, roads, rivers and canals. It will be of welded construction and fully protected against corrosion. It is hoped that construction will commence towards the end of the year and be completed by the end of 1961.

★ After a lull in the announcement of major U.K. chemical projects come plans from two companies—I.C.I. (p. 317) with the first plants for their Severnside project (35,000 tons of ethylene oxide and derivatives) and Cyanamid of Great Britain with plans for a 6 million lb. a year melamine plant at Gosport (p. 320).

The Severnside plants—scheduled on stream in early 1962—will boost existing ethylene oxide capacity beyond the present 65,000 tons a year figure, bringing competition to the two newest U.K. plants, those of Shell Chemical at Carrington (25,000 tons), and Union Carbide at Fawley (22,500 tons), both of which were due on stream at the end of 1959. Ethylene for the new I.C.I. plants will for the first time come from an outside supplier—Esso, whose 40,000 tons/year plant at Fawley also supplies feedstock to the nearby Monsanto polythene and Union Carbide plants. Esso are to raise their ethylene capacity with a £5.5 million extension and will lay a 70-mile pipeline to the Severnside works.

Cyanamid of Great Britain will bring competition to the U.K.'s only present producer of melamine—British Oxygen Chemicals, who have never disclosed their melamine capacity. In his recent annual statement (see p. 321), Mr. J. S. Hutchison, chairman of British Oxygen Co. referred to growing competition from imports and lower prices. He added that B.O.C. expected to hold their own.

It is appropriate that Cyanamid should add to their large U.S. capacity in this way, for Cyanamid scientists in 1934—100 years after the discovery of melamine—found that it reacted with formaldehyde to produce resins with unexpected and valuable qualities. Main uses are in decorative laminates (Formica, etc.) and moulding compounds with other uses as canteen ware, paint bases, paper and textile auxiliaries and in adhesive and bonding agents.

★ Terminology in rapidly growing industries, such as chemicals and plastics, is often apt to develop out of step with industry. A good case of this was instanced recently by Dr. C. G. Sumner of the B.S.I. who criticised emulsion terminology (Chemical Age, 13 February, p. 281). Since that issue went to press I have received a copy of a contribution that Dr. J. R. Edisbury, chairman of the North of England Section, Society for Analytical Chemistry, made on ABVNs in Bulletin No. 12 of the Photoelectric Spectrometry Group, Cambridge.

Dr. Edisbury says that abbreviations are rather like rabbits; they are undoubtedly attractive, but apt to multiply alarmingly. He recommends reasonable control of both, and was particularly concerned with the use of full stops. Does one for instance write: p.s.i., psi, or, as has been suggested, with decimal points, p·s·i.

Among those who omit the stops, there are some who still leave a gap—D Sc, for instance. Dr. Edisbury says "It just looks wrong to us, somehow: naked, sold, uncared-for, with a hungry looking gap." I agree with his personal preference for the unadorned Mr, Dr, Co, Ltd, Inc, cm, ml, lb, cu in or sq ft, ppm, etc.

★ Models are now an accepted part of chemical plant design and construction techniques. The most spectacular savings in time and effort and money have come in piping design work; I.C.I.'s target, for instance, is to cut down this work by 50%. They are not there yet, but the goal is in sight. Mr. R. G. Strickland, of Billingham Division, writing in the February *I.C.I. Magazine*, says that a much better quality of design has resulted from the use of models.

Under the title 'Models pay off' he briefly mentions the Billingham 'do-it-yourself' kit comprising old matchboxes and tobacco tins to represent main pieces of equipment—this method, however, is strictly for use when piping does not significantly influence layout. Mr. Strickland mainly writes about the part that a £2,400 model played in a recently finished extension to a distillation plant.

Many of the pipes had to be run on the model before layout could be fixed. The model also determined the design of structural frameworks for supporting equipment; the structure was in fact designed round the plant. The most complicated job was putting in the piping on the ½ in. to 1 ft. scale model; the model maker taking 10 weeks to pipe-up the model.

Mr. Strickland adds that the distillation plant extension went into production with a smooth start-up at the end of last year "as is usually the case when models are used for design and construction."

★ While bulk-carriers built for an outmoded coal trade rust at their moorings and brand-new tankers languish in idleness, exciting prospects are foreseen for the latest fuel carriers, the L.P.G. ships, according to the January edition of *The Monthly Freight Review*. These vessels are designed for the bulk carriage of liquid petroleum gases, propane, butane and methane. The largest L.P.G. ship on the stocks is a 9,000 tonner now building in Norway and scheduled to carry 50,000 barrels of liquid gas. A refrigerating plant will maintain the cargo at less than 10°F and it will be held at not more than 40 p.s.i.

Unhampered by lobbying from coal interests, Japan is perhaps the most active of countries in this field. The L.P.G. *Maru I*, of just over 1,000 tons gross, is entering service transporting butadiene to synthetic rubber factories. The Sumitomo Chemical Co., Osako, are already far advanced in a project to buy liquid gases from a major U.S. oil company and plan to put their own 20,000 tonner into service by 1962. Ships of a similar size are envisaged by the Tokyo Gas Company, who will get their supplies for the enrichment of town gas from the Persian Gulf.

All these developments are effecting big savings not only in shipbuilding but in carrying and handling costs. Other possibilities lie in the exploitation of sea transport for some of the new methods already developed for land and inland-waterway transport, particularly the carriage as hot liquids of materials such as sulphur and concentrated solutions of caustic soda and nitrogenous fertilisers. Attractive savings are seen in the elimination of the high cost of drums or bags and stevedoring operations.

★ Olin Mathieson's new anti-freeze that is claimed not to corrode aluminium or other metal engine parts, was developed in anticipation of the wider use of aluminium in car engines. One of the problems in developing the new formula involved the need for a better corrosion inhibitor system; this in turn involved a correctly balanced formula.

The balance of the new formula is said to result in an improved ethylene glycol anti-freeze that is harmless to non-metallic parts and non-corrosive to all metals. Non-evaporating, it is suitable for any type of engine that uses a liquid coolant.

★ The conference called by Sir Clavering Fison to consider the Monopolies Commission's report on fertilisers on Tuesday (p. 320) was taken as an opportunity to raise the question of Fisons' bid for British Drug Houses. Sir Clavering, I was amused to hear, said that his company was looking for industries which could attract a higher profit ratio than 17½% (see p. 315) without attracting the attention of another commission.

He was quite emphatic that Fisons were not seeking a bigger share of the fertiliser market.

Sir Clavering also confirmed that the directors of B.D.H. were not prepared to recommend the Fisons' bid. B.D.H. are expected to reply giving an estimate of 1959 profits to show an improvement over 1958, coupled with a dividend increase up to 14%, it is suggested, compared with the previous 12%. A higher offer from Fisons in the absence of another bidder, could be decisive.

Alembic

MONOPOLIES REPORT ON FERTILISERS

Operations of I.C.I., Potash and Fisons are "Not Against the Public Interest"

REPORT of the Monopolies Commission on fertilisers published this week states that neither the I.C.I. monopoly in nitrogenous fertilisers, nor the operations of Potash, nor the Fisons' operations in potash and superphosphates and compounds are against the public interest. It is felt, however, that Fisons' level of profits is against the public interest.

The Commission, which has been studying the industry since October 1955, issued its report—'Report on the Supply of Chemical Fertilisers' (H.M.S.O., 10s 6d)—to Parliament on Tuesday.

Evidence was taken from the principal suppliers of the six classes of chemical fertilisers—Imperial Chemical Industries Ltd., principal suppliers of nitrogenous fertilisers, 74%, class (a)*; Potash Ltd., principal suppliers of potassic fertilisers, 76%, class (b); Fisons Ltd., principal suppliers of superphosphate, 43%, class (c) compounds, 43%, class (f), one of the principal suppliers of ground rock phosphate in class (d) and basic slag, 40%, class (e), and the principal purchaser of fertilisers in class (h); British Basic Slag Ltd. (B.B.S.), another principal supplier of fertilisers, 37%, in class (e).

I.C.I.'s subsidiary, Scottish Agricultural Industries Ltd. (S.A.I.), and the British Sulphate of Ammonia Federation Ltd. (B.S.A.F.) a trade association with whom I.C.I. are closely concerned, have also given evidence.

Conclusions and Recommendations. The Monopolies Commission's conclusions as to the bearing upon the public interest of the 'conditions' and 'things done' with which it has been concerned are summarised thus:

Regard for Public Interest

In class (a) Nitrogenous fertilisers, neither I.C.I.'s monopoly nor any things done by the company operate or may be expected to operate against the public interest. In the Commission's opinion, I.C.I. in development and conduct of their fertiliser business have shown a conscious regard for the public interest.

In the potash field, class (b), the Commission has found that there are no things done by Potash Ltd., which operate or may be expected to operate against the public interest. The fact that the company is part of an international organisation designed to eliminate competition does, however, operate against the public interest.

Neither Fisons' position as the predominant buyer of potash nor any things done by the company in that capacity operate or may be expected to operate against the public interest. Fisons' position as the predominant buyer of potash is a consequence of their monopoly position as a supplier of compounds. The company says that it has used this position "successfully to bargain for lower prices, with resulting advantages to all buyers of potash." The Commission records that they think Fisons are amply justified, particularly in the circumstances surrounding the supply of potash to the U.K., in using their buying power to obtain the best possible terms.

Fisons' 'monopoly' as such in class (c) (superphosphate) and class (f) (compounds), is stated not to operate against public interest nor may be it expected to do so. The fixing of prices by the company at a level which produces profits at the high rate of recent years (20% and even as high as 29.3% in 1955-56) is a thing done by the company as a result of its monopoly position which does operate and may be expected to operate against the public interest. The Commission state "We think the company is mistaken in believing that it is entitled to use its strength, due largely to the degree of monopoly it enjoys in a protected and subsidised market, in order to earn profits at the high rate of recent years for the express purpose of financing its further overall expansion."

Ground Rock Phosphate

In class (d) (ground rock phosphate), the conditions of the Act are found not to prevail, and in class (e) neither the 'monopolies' of Fisons and B.B.S. nor any things done by either company operate or may be expected to operate against the public interest. The potential dangers to the public here are considered by the Commission to be somewhat diminished by the circumstances that the two main suppliers in this field are independent of one another, and there is also a safeguard in the availability of superphosphate, which is not entirely under Fisons' control.

Having found that Fisons and B.B.S. each follow a moderate price policy, the Commission sees nothing contrary to the public interest in the existence of these monopoly positions or in anything done by either company in relation to this class of fertiliser.

Action Required. In the case of Potash Ltd., the Monopolies Commission does not think that the company's suppliers should be made to compete with one another either by splitting up Potash Ltd.'s monopoly of the potash they supply or by any other action which might be taken in this country. Action to ameliorate the effects of the existing situation is suggested.

In the report the Commission comments on the beneficial effects of competition from East Germany in recent years. (In 1952, after the end of Government trading, Potash Ltd. acted as the sole importer of East German potash for supply to the U.K. market, but in the following year the East German potash suppliers appointed Propane Fertilisers as their agent, and at no time since the 1952-53 season has Potash Ltd. imported from East Germany or from any source other than France, West Germany and Spain.) It suggests that everything possible should be done to seek and develop still other sources—including Canada, the U.S., Israel and Russia—for some part of this country's requirements of potash.

Bargaining Position

Fisons and I.C.I., the report indicates, are already pursuing such a policy with some effect. The Commission, however, thinks it should be possible to find additional methods to strengthen the bargaining power of the consumers of potash in this country, having regard to the fact that the U.K. constitutes one of the largest and most attractive export markets for the potash producers. It is recommended that the Government should consult with Fisons, I.C.I. and other large buyer as to the further measures that might be taken to develop the strongest possible bargaining position by utilising this aggregate buying power.

On the question of potash, the report notes that the Committee on Grassland Utilisation is satisfied that there is now a good case in principle for a fresh subsidy, of the same order as those now prevailing for nitrogenous and phosphatic fertilisers, to encourage the use of potash. This committee expressed the hope "that a limited degree of risk of monopolistic practices would not necessarily dissuade the Government from encouraging the use of potash by subsidy". The Commission does not think it is for it to make any recommendation as to the action they should take on subsidies.

Of Fisons' pricing policy and the level of profits resulting from it, the Commission says it does not believe that the company has acted in deliberate disregard to the public interest. It recommends that Fisons should adjust their pricing policy to yield a lower level of

* Class (a). Ammonium sulphate, Nitro-chalk, sodium nitrate, ammonium nitrate.
Class (b). Potasium chloride kainite, potassium sulphate.
Class (c). Calcium superphosphate (single), calcium superphosphate (triple).
Class (d). Ground rock phosphate.
Class (e). Basic slag.
Class (f). Compound and complex fertilisers.

profit than has been achieved in recent years, and it believes that the company can be relied on to carry out this recommendation in the light of the Commission's report.

Following the conclusions and recommendations of the report there is a note of dissent by Professor G. C. Allen and a reservation by Sir Thomas Barnes, two members of the 10-man Commission. Professor Allen, an economist, in his dissent disagrees with his colleague members in their view that the public interest is as well served by one system of pricing as by the other. To his mind, Parliament, in determining agricultural policy and voting subsidies, should be aware of the true costs of sustaining 'remote' farmers. "It is against the public interests that these costs should be obscured by what is, in effect, a hidden subsidy made possible by the monopoly suppliers' practice of charging uniform delivered prices". His conclusion is "that the public interest would be served if the English were to follow the Scottish example, and that the recent extension of the practice of charging uniform delivered prices in Scotland is to be deplored".

Professor Allen is encouraged to draw this conclusion by the evidence that Fisons themselves were seriously considering the introduction of ex works pricing. If Fisons were to make this change and to relate ex works prices to costs at particular manufacturing points, then "the pattern of production and location of new factories might well be affected". To admit that this might be the consequence is to acknowledge implicitly the distortion in the present pattern of production and costs, and the economic use of resources that attends the charging of uniform delivered prices in the industry.

The reservation made by Sir Thomas Barnes is in connection with the finding that it is against the public interest that a monopoly supplier (Potash Ltd.), responsible for the major part of the country's supplies of potash, should be part of an international organisation designed to eliminate competition. He feels the natural meaning of this finding is that the association of Potash Ltd. with the Western European producers and selling agencies of potash should cease, and this he thinks would be most unfortunate.

In the Commons on Tuesday, Mr. R. Maudling, President of the Board of Trade, said he would seek the industry's co-operation in giving effect to the Commission's conclusions.

Fisons Welcome Monopolies Report

COMMENTING on the Monopolies Commission Report on the U.K. fertiliser industry within three hours of its publication, Sir Clavering Fison, chairman of Fisons Ltd., said he was very pleased with the commission's report. In particular, the concluding paragraph of the committee's conclusions and recommendations gave him great satisfaction. This states that "in the matter of Fisons pricing policy and the level of profits resulting from it, we do not believe that the company has acted in deliberate disregard of the public interest". The commission went on to recommend that Fisons should adjust their pricing policy to yield a lower level of profit than has been achieved in recent years. It believed the company could be relied on to carry out this recommendation in the light of the commission's report.

On the commission's criticism of Fisons' price policy in the years to 1957, when it considered that the company achieved a higher level of profit than was justified, Sir Clavering said that in general he accepted that criticism, but he was able to say, as was well known today, that since 1957 Fisons had in fact modified their price policy. According to the report profits on their home fertiliser business for the six years to 1956-57 expressed as percentages were respectively 11.8, 19.3, 23.0, 23.0, 29.3 and 21.6. In 1957-58 (the report only goes to 1957) profitability on capital employed was 19% and in 1958-59 was further reduced to 17½%. This compared with profitability of all industry of 16%. Since 1957 Fisons had also made considerable price reductions and for the current year significant price reductions could be expected. Profitability was likely to be below 17½%, Sir Clavering stated.

Sir Clavering said that Fisons have substantially put into being the recommendations of the Monopolies Commission report. It was a great source of satisfaction to him that the commission commented favourably on Fisons' technical efficiency and in particular that the National Farmers' Union of England in its evidence regarded their technical advisory services as "technically first rate".

Professor Allen's remarks (see above) had strong support from Fisons, Sir Clavering recorded. With regard to potash trade and the commission opinion that still other sources such as Canada, the U.S., Israel and Russia, should be sought, he said that the matter had been discussed and was still being discussed with I.C.I. and Fisons' chief director is going to Moscow shortly. They had done everything to break the potash monopoly and had bought potash from the U.S.S.R. They had been the first company to buy potash from East Germany, to break the potash cartel.

Wilton Division Wins Safety Contest

A reduction over the past year of 23% in the accident rate placed Wilton Division first in the I.C.I. inter-Division safety competition for 1959, making this the fourth time that the Accident Prevention Trophy has gone to the Wilton site.

General Chemicals Division were second with a reduction of 4.9%, and Metals Division third with reduction of 2.2%. None of the ten divisions in the contest achieved any improvement on their previous best.

Cyanamid Plan U.K. Melamine Plant

A MELAMINE plant with a yearly capacity of 6 million lb. is to be built by Cyanamid of Great Britain Ltd., U.K. subsidiary of American Cyanamid, on a site that has been acquired adjacent to their Lederle Works, Gosport, Hants. The project, which involves a total investment of more than £430,000, is scheduled for completion by early next year.

Engineering design is in progress and contracts for civil and engineering works will be let in due course; tenders are out for contracts.

Mr. O. N. Williams, managing director of Cyanamid of Great Britain, stated that construction of the new plant would introduce Cyanamid to the manufacture of the so-called 'bread and butter chemicals' in the U.K. The new plant would, he added, enable Cyanamid to give better service and technical support to their customers and should spur the development of a wider use of plastics in Britain. (See also 'Distillates', p. 318.)

Future Pattern of the Gas Industry

CAPITAL investment forecast for the Gas Industry for the seven years beginning April 1959 is £352 million, and other capital requirements amount to £18 million.

The current research programme includes a new pilot plant near Manchester for development and application of new techniques for converting low-grade coal. Increased usage of tail gases from oil refineries is also envisaged, and trials and experiments with imported liquid natural gas are to be continued.

Future pattern of the gas supply may thus be a smaller number of large gas works, adjacent to coalfields and refineries. Gas produced would be fed into arterial mains also capable of carrying gas produced by current conventional means.

The Gas Council state that this is still a long-term project, but it is hoped that it will provide overall economies.

Long Chain Amines in Flake Ease Drum Emptying

LONG-CHAIN amines, such as Armeen HT (made from hydrogenated tallow) Armeen 18 (pure octadecyl amine) and other amines with their acetate salts, are now being supplied by Armour Hess Chemicals Ltd., 4 Chiswell Street, Finsbury Square, London E.C.1, in flaked form, to overcome difficulties of drum emptying.

These chemicals have melting points in the region of 55°C which makes them difficult to empty from drums. In many cases, the material has first to be melted, an expensive and awkward operation. Now, however, they are being packed in 100 lb. net fibre kegs, are free flowing and easily handled; this is a particular advantage where these cationic surface active chemicals are used in water treatment in the flotation of ores, as anti-caking additives for fertilisers, in fact, wherever accurate dosing in small amounts is necessary.

BRITISH OXYGEN TO ENCOURAGE DEMAND WITH KEEN PRICES AND GOOD TECHNICAL SERVICE

"COMPETE or die is industry's choice today," so remarks Mr. J. S. Hutchison, chairman of British Oxygen Co. Ltd., in his annual statement. He points out that price agreements are being abandoned, tariffs lowered, new processes introduced, amalgamations arranged and everywhere increasing competition. In his consideration of prospects for British Oxygen, Mr. Hutchison reports that the company has had a general increase in home sales in the first quarter of the financial year. "This may become greater as the year goes on with the increased activity now being experienced in the heavier sections of industry, but profit growth in the home gases division is likely again to be moderate. On the other hand, profits from chemicals, equipment and electric welding should show improvement." Profits in total of the company's overseas associated companies now represent almost half the total earnings of the group, but with the generally better trading another good year from this source is expected.

Gases Division. Lower demand for products of the U.K. gases division was noted in the first half year. This was balanced by a general improvement in trading in the second half, which saw peak sales of liquid oxygen for steelmaking and other special purposes prior to new tonnage plants coming into operation. Over the year to 30 September 1959, compressed and liquid oxygen, acetylene and propane just reached the sales volumes and earnings of the previous year; the moderate addition to profits in the division came from continued growth in the use of nitrogen and argon, and from a general improvement in other activities.

Wage Costs Higher

In the year under review an extra £250,000 has had to be met for the wage award made in October 1959 and £240,000 for additional depreciation on normal capital extensions. Other costs may amount to a further £250,000. In the past, Mr. Hutchison states, the great expansion in liquid oxygen sales has helped the company to absorb such costs, but this no longer applies with the transfer of the heavy bulk sales to tonnage oxygen. "In the last four years liquid oxygen sales have not had any big increase, and with the costs mentioned our profit return, which is already much less than a few years ago, will not be maintained unless there is greater improvement in sales than we have seen so far this year."

In the past year the notable feature was the rapid growth in demand for oxygen and other industrial gases on a scale to be met only by very large production plants at the point of use. Present tonnage plant capacity of British Oxygen's gases division of 900 tons a day is being increased to 2,200 tons a day under new long-term contracts for the requirements of the steelworks industry.

All this business has been obtained against very sharp competition and is not expected to yield "easy profits". The outcome is dependent, Mr. Hutchison says, on design, manufacture and operation over a period of years, of plant units costing £500,000, £750,000 or more each.

The same competitive aspects apply in the company's liquid oxygen trading. In fuel gases, acetylene growth has been slowed in recent years by an upsurge in the availability and use of propane. Sales in the first quarter of the current year have improved.

Engineering and Construction Work. The year was one of great activity in the construction and installation of tonnage oxygen and nitrogen plants as well as chemical plants of other types and ancillary equipment.

British Oxygen Linde contracts for the tonnage oxygen plants required for the Durgapur and Rourkela steelworks in India are nearing completion. The first 100-ton-a-day plant at Rourkela has been brought into operation and the other two follow shortly. The Durgapur plants are due for completion within the next few weeks. The two 100-ton Tonnox plants for the Westfield Lurgi gasification plant are being completed.

The extensive installations at the Government rocket research station at Spadeadam are being completed by British Oxygen Wimpey Ltd. and will be brought into operation on schedule.

The chemical plant workshops at Edmonton will be "very busy for the next two years", the chairman states, in building 11 tonnage oxygen and nitrogen plants now on order, mostly for use by British Oxygen companies and having a value of about £6 million.

British Oxygen Chemicals Division's Trading. British Oxygen Chemicals Ltd. had a good year with trading improving as the year advanced. Earnings were "almost comparable with the preceding year" and manufacturing economies enabled reduction in selling prices to be made. Sales during the year were above expectation.

While competition in melamine was growing and world prices were being lowered, the company expected to hold its own. Good progress had also been made with polyvinyl acetate.

U.K. Sulphuric Acid Consumption Rises

U.K. CONSUMPTION of sulphuric acid and oleum during the final quarter of 1959 totalled 664,062 tons, representing a rise of some 90,000 tons over the previous quarter. Production by chamber and tower totalled 108,096 tons during the period, and that by contact 548,593 tons (85,481; 480,970 for previous quarter). The following summaries issued by the National Sulphuric Acid Association exclude all Government plants.

SULPHURIC ACID & OLEUM

(*Tons of 100% H_2SO_4*)

	Chamber and Tower only	*Contact only*	*Chamber Tower and Contact*
Stock 1 October 1959	21,919	78,679	100,598
Production ...	108,096	548,593	656,689
Receipts	20,295	33,208	53,503
Oleum Feed ...	—	489	489
Adjustments ...	—3	+774	+771
Use	72,646	373,140	445,786
Despatches ...	52,595	211,625	264,220
Stock 31 December 1959	25,066	76,978	102,044
Total Capacity Represented ...	140,430	620,130	760,560
Percentage Production ...	77.0%	88.5%	86.3%

U.K. CONSUMPTION

	(*Tons 100% H_2SO_4*) 1 Oct. to 31 Dec. 1959	1 July to 30 Sept. 1959
Trade uses		
Accumulators	3,451	2,901
Agricultural purposes ...	424	5,908
Bromine	4,503	4,153
Clays (Fuller's earth, etc.) ...	2,590	2,514
Copper pickling	543	524
Dealers	4,176	3,605
Dichromate and chromic acid	5,508	4,965
Drugs and fine chemicals ...	5,386	4,768
Dyestuffs and intermediates	28,578	24,250
Explosives	3,913	2,720
Export	420	747
Glue, gelatine and size ...	129	100
Hydrochloric acid	13,628	11,134
Hydrofluoric acid	3,476	3,242
Iron pickling (inc. tin plate)	33,618	29,095
Leather	1,106	1,053
Lithopone	3,852	3,199
Metal extraction	839	691
Oil refining and petroleum products	18,686	15,247
Oils (vegetable)	2,120	1,766
Paper, etc.	1,971	1,560
Phosphates (industrial) ...	830	659
Plastics, n.e.s.	14,550	12,487
Rayon and transparent paper	72,522	65,091
Sewage	3,270	3,355
Soap, glycerine and detergents	28,607	27,466
Sugar refining	428	154
Sulphate of ammonia ...	70,628	64,142
Sulphates of copper, nickel, etc.	5,086	4,043
Sulphate of magnesium ...	54	47
Superphosphates	151,007	109,568
Tar and benzole	5,053	6,341
Textile uses	4,545	2,693
Titanium dioxide	112,366	103,362
Unclassified	56,199	48,612
Total	664,062	572,162

RAW MATERIALS

	Pyrites	*Spent Oxide*	*Sulphur* *Imported*	*Sulphur* *Recovered, H_2S and Filter Cake*	*Zinc Concentrates*	*Anhydrite*
Stock 1 October 1959 ...	147,245	91,796	71,251	7,689	51,378	11,794
Receipts	86,222	57,610	77,122	15,332	52,149	184,651
Adjustments	—90	+500	+337	—86	+311	—
Use	84,930	59,940	93,594	14,455	49,759	188,314
Despatches	316	1,491	3,828	2,014	—	—
Stock 31 December 1959 ...	148,131	88,475	51,288	6,466	54,079	8,131

Phenol Price Decontrol would Switch Tar to Use as Fuel

Evidence at Restrictive Practices Court

WHAT is expected to be a 10 days' hearing of the price-fixing agreement of the Phenol Producers' Association before the Restrictive Practices Court, began in London on Monday.

Speaking on behalf of the Association Mr. B. J. M. Mackenna, Q.C., said that there were 15 companies in the association. All produced phenol and all were parties to the agreement. Thirteen of the companies produced natural phenol by refining crude tar acids.

Value of Phenol Produced. In 1956, 2,876,000 tons of crude tar were distilled, and the crude tar acids extracted totalled 85,000 tons. The value of the pitch and creosote sold was just under £21 million, and the tonnage was 2.3 million. Naphthalenes and anthracenes were valued at almost £4 million, although the weight was only 113,000 tons. In the same year, 12,000 tons of natural phenol were produced and 60,000 tons of refined cresylic acid which together were valued at £6.5 million.

Main Tar Producers

Principal producers of tar were area gas boards, who usually made their tar available to one or other of the distillers operating co-operative schemes. Two circumstances made it difficult to adjust supply and demand, Mr. Mackenna indicated. The first was that tar continued to be produced whatever might be the demand for phenol. It had to be disposed of without delay. The second was that the manufacturing unit for the production of phenol was large and had to work to full capacity if it were to operate profitably. The association contended that at present there was an excess of supply over demand which was likely to increase.

Price Control. Removal of price control would mean a serious risk of the price of phenol and of the other connected products falling so low that the level of return would be less than if tar were used for fuel. There was also a serious risk that the tar producer, if his tar return fell, would divert his tar to the more profitable use as a fuel. The result of that would be that the products of tar distillation would be lost, which would be to the detriment of the public.

Basic price of good gravity phenol in January 1945 was 9½d. per lb. Since January 1954, the price had been stabilised at 1s 4d.

In 1950, Mr. Mackenna reported, home trade in phenol was 15,786 tons and production was 16,701 tons. By 1959, the home trade had risen to 36,550 tons with production totalling 45,591 tons.

The Association. The English Phenol Convention was founded in 1927. The name was later changed and the present name of the Phenol Producers' Association was first used in 1950. The association had, since its foundation, fixed selling prices. After the Second World War there was a shortage of phenol, and in 1951, the substance was being imported at an average price of 3s per lb. The home price had never risen above 1s 6d per lb. In 1951 only 232 tons were exported, but 1,317 tons were imported from the U.S. The association considered that at that time no further contracts should be made for export of phenol.

In the middle of 1952 the shortage came to an end and since then production had been in excess of the home market. The increased production of phenol had undoubtedly come from the manufacturers in the synthetic field.

Replying to a question by a member of the Court, Sir Stanford Cooper, Mr. Mackenna said that tar was a compelling force. It had to be got rid of. The distiller was bound to take it because the gasworks have no means of storing it and had an agreement which entitled them to require the distillers to take it.

Production in 1959. Last year 9,000 tons more phenol were produced than was required for the home market. It is estimated that the 1960 production will be 54,000 tons—that is 9,000 tons more than last year. The reason for this increase, Mr. Mackenna reported, was that British Hydrocarbon Chemicals' new plant at Grangemouth would be coming into production and would greatly add to the amount of phenol produced.

Products would be Lost

If tar were not distilled, Mr. Mackenna pointed out, other products would be lost such as cresylic acid, which is used in plastics manufacture and *o*-cresol which is used in making selective weedkillers. The association held the view that if tar was diverted from distillation uses, the diversion would not be temporary. Also although it had been stated that the difficulties facing the phenol producers could be overcome by not extracting crude tar acids, it had been found that it was uneconomic to distil unless the crude tar acids were extracted.

In the second day of the hearing a description of tar distillation methods was given.

Chairman and joint managing director of Yorkshire Tar Distillers and director of Synthetic Chemicals, Mr. J. B. Vickers, first witness for the association, said that there was a vast difference between tar produced in a gas works and that produced by coke ovens. Coke-oven tar contained the smallest amount of crude tar acids, but on the other hand was rather rich in phenol. Part of the problem of finding a correct price, he said, was the difference between the amount of tar acids in the various kinds of tar. If an acid contained more than 20% phenol, it was crude carbolic acid and a smaller percentage would be classed as cresylic acid. Costs varied, depending upon the phenolic content of the crude tar acids. These had to be refined in order to obtain phenol, ortho-cresol and xylenol.

Use of xylenol in industry was comparatively new, particularly in the plastics field where it had become a substitute for *m-p*-cresols in the last three years, said Mr. Vickers. "Demand from the plastics industry for *m-p*-cresols was such that not enough could be produced.

It was realised that if the industry had to expand, some other raw material would have to be found. There was a certain amount of joint research and it was found that xylenol could be substituted. Yorkshire Tar had lowered the price to give them some incentive."

Phenol Business Dropped

The prices per lb. of the products were: pure cresol, 1s 2d.; *m-p*-cresol, 10d to 1s 2d; xylenol, 6d to 8d; cresylic acid, 7d to 8d; *o*-cresol mixture 8½d to 9½d; high boiling tar acids, 5d to 5½d.

When considering prices, Mr. Vickers explained, they had to have regard to the global position and the position of their customers. His company decided to go into the synthetic phenol business just after the war in partnership with Bakelite. Phenol was in short supply at the time. The plant was finally erected in 1954, and was capable of producing 5,000 tons. But it never produced more than 2,500 tons because there was then no market for it and this increased the costs of production very considerably. As a result, it had gone out of the synthetic phenol business.

In the naphthalene field, there was at present a shortage of about 9,000 tons a year. Production was between 55,000 and 65,000 tons a year. There was a world shortage of naphthalene, used for phthalic anhydride manufacture.

Cross-examined by Mr. T. Roche, Q.C. (for the Registrar of Restrictive Trade Agreements), Mr. Vickers did not agree that there was a stockpiling of phenol. Total income from phenol was about 6% of the income from the treatment of tar.

Mr. Roche asked whether it was just a question of economics. As long as the price of phenol was fairly high it paid to get it out; and if natural phenol became unsaleable, naphthalene could still be produced.

Mr. Vickers: "That is perfectly true, but I do not know how long it would be before we found ourselves in the bankruptcy court."

He told Mr. Roche that it depended on the willingness of buyers of naphthalene and so on to bear the extra 6% which would be lost if phenol became unsaleable.

The hearing is likely to continue into next week.

Graesser's New Tar Acid Plant

A NEW continuous tar acid distillation plant has just been brought into operation by R. Graesser Ltd., Sandycroft, Chester.

This plant consists of a dehydration section, a depitching section, a dephenolating section and a metaparacresol section and was designed jointly by R. Graesser and Newton Chambers and Co. Ltd.

Erected by Newton, Chambers, it is capable of a feed rate of 500 g.p.h. of crude tar acid, which will nearly double the present production at Sandycroft. The plant is fully instrumented.

To enable this unit to come into operation, major expansion has had to take place on other sections of the works, particularly the boiler house.

R. Graesser Ltd. have been tar acid refiners and phenol producers since 1867, but the Sandycroft plant came into operation in 1935, and is now claimed to be one of, if not, the largest, tar acid refinery in the U.K. and one of the largest in the world. Main products derived from the crude tar acids at Sandycroft are phenol, *o*-cresol, *m-p*-cresol, cresylic acids, xylenols, and high boiling tar acids. Also produced at Sandycroft is diphenylolpropane, or bis-phenol.

To ensure crude tar supplies, R. Graesser in 1945 amalgamated with Lancashire Tar Distillers, who have works at Cadishead, Weaste, Varley Street, Preston, Church, Litherland, and Bootle. Although Lancashire Tar are the main suppliers of crude tar acids to Graesser, other suppliers are: National Coal Board, Staveley Iron and Chemical, and Normanby Park Tar Supply.

40-Ton Plywood Silos for I.C.I. Alkali Division

SPECIALLY made by Portosilo Ltd., York, for the Alkali Division of I.C.I., four steel-bound silos fabricated out of plywood and each capable of containing up to 40 tons of material have been installed at the Winnington sodium sesquicarbonate plant.

The silos which, were designed by Mr. G. Fletcher of the I.C.I.'s engineering department, are 37 ft. high and 8 ft. in diameter.

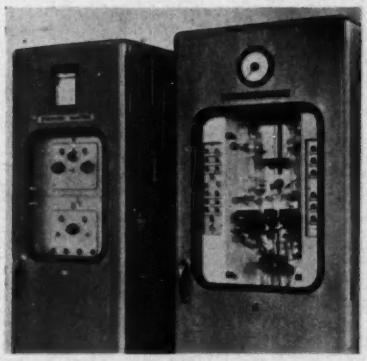
The company state that during the sesqui-making process the particle size varies. Now, with the aid of the new installations, loading into each of the silos in turn and subsequently packing out from all sections simultaneously, produces a much more uniform product than hitherto.

Works Brigade Controls Monsanto Newport Fire

A fire, which broke out in the oil additives plant at the Newport, Mon, works of Monsanto Chemicals Ltd. on Monday, caused only slight damage. It was prevented from becoming serious by the prompt action of the works fire brigade.

E.I.L. Analyser Adapted for Aluminium Ore Sampling

FIRST Canadian order for the Titromatic analyser of Electronic Instruments Ltd., Richmond, worth more than $10,000 and placed by the Aluminium Co. of Canada Ltd., posed a difficult problem because of the corrosive nature of the reagents needed in the assay of the aluminium content of ore. Because the basic design of the instrument permits great versatility, it was possible to make special arrangements for flushing and mechanically brushing the electrodes after each titration.



E.I.L. Titromatic analyser recently sold to Aluminium Co. of Canada to cut production costs by raising the accuracy of production control

E.I.L. claim that almost any analytical problem involving titration can be made from a suitable assembly of standard parts. It was only after the chemist in charge of the Canadian process had spent three weeks testing and evaluating the new equipment at E.I.L.'s Richmond works that his company placed the order. The first Titromatic analyser to be supplied to North America was delivered late last year to the Esso refinery at Baton Rouge.

Aluminium Co. of Canada intend to use the analyser to assay the aluminium content and the free alkali of five separate ore plant streams. To perform this, the instrument automatically carries out a double end-point titration with two added reagents on each of the five streams. All taps, vessels and piping in contact with the highly corrosive ore liquor are lined with p.t.f.e. To avoid scale formation, the complete sampling system is flushed frequently with water and acid. After every titration, the electrode system is cleaned by mechanical brushing under alternate sprays of acid and water.

New Dracone Company Backed by Hambros

BRITISH development in the carriage of cargoes by water, the Dracone flexible barge, which was evolved by four Cambridge scientists four years ago and sponsored by the National Research Development Corporation, is now launched commercially with the formation of Dracones Operations Ltd. The new company is backed mainly by associates of Hambros Bank and H. Clarkson and Co., ship brokers. It is also associated with Dracone Developments, an offshoot of N.R.D.C.

Chairman of the new company is Admiral Sir John Eccles, who is also a director of Dracone Developments and H. Clarkson. Also on the board are Professor W. R. Hawthorne, who with Sir Geoffrey Taylor and Mr. John Shaw, of Cambridge University, conceived the idea of the Dracone. Other directors are Dr. B. J. A. Bard (an executive member of N.R.D.C. and vice-chairman of Dracone Developments), Mr. W. H. A. Pritchard-Gordon (director, H. Clarkson and Co.), and Mr. L. C. Grand (of Hambros Bros. Bank).

Dracone Operations Ltd. are associated with P. B. Cow and the Frankenstein-Beaufort organisation for the manufacture of the barges. Dracone Developments will continue with their research and development work with N.R.D.C. assistance.

I.C.I. Phthalic Plant Now on Economic Basis

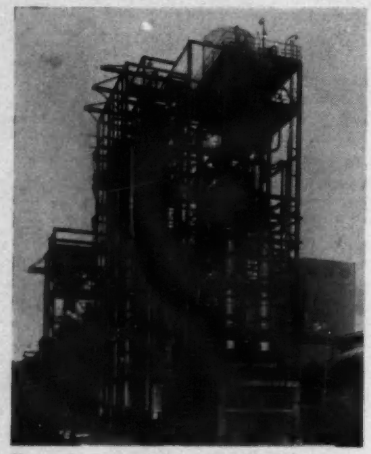
THE phthalic anhydride plant at I.C.I. Wilton Works "which has had every sort of bad luck, has now got going on an economic basis", stated Mr. R. A. Banks, I.C.I. director, at Wilton recently, when he congratulated everyone concerned. He said that capital spending at Wilton, around £11 million last year, might continue at roughly the same level this year and in 1961.

The capital programme had been somewhat cut back in 1959 from the fantastically large figures current in recent years. The company tried to plan ahead and to forecast a five-year capital programme, but things changed so rapidly that such a forecast might only apply for two or three years.

Last year at Wilton saw the start up of No. 3 olefin plant, No. 4 polythene plant, and extensions to Terylene and nylon plants. Mr. Banks described the new Propathene polypropylene plant as an exciting example of how, when really pressed, one could organise for very rapid plant building.

Appleby-Frodingham's Continuous Benzole Fractionation Unit Designed and Built by A.P.V.

FIRST plant in Britain to produce nitration grade boiling-range benzole and toluole, 2° xylole and 160/190° naphtha continuously from crude coke oven benzole, is that at the Scunthorpe coke oven and chemical plant of the Appleby-Frodingham Steel Co. (branch



General view of the new A.P.V. benzole refinery at the Scunthorpe Works, with previous A.P.V. installation in the background

of the United Steel Companies Ltd.). A fully continuous benzole refining plant, it was designed and constructed by the Chemical Engineering Division of the A.P.V. Co. Ltd., Crawley, Sussex.

Design throughput of the plant is 5½ million gallons a year, and a striking advance in the benzole refining field is the operation of five continuous fractionating columns in series.

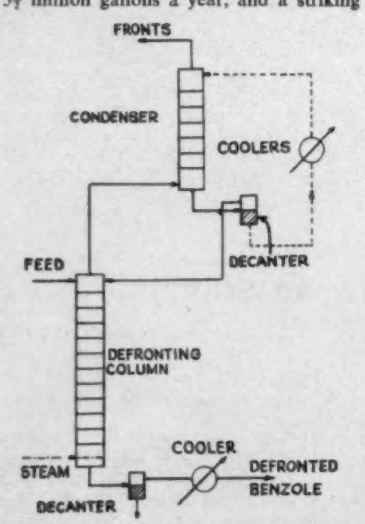
Test runs established that at a throughput rate of over 650 gall. an hour of crude benzole the refinery produced the above mentioned products with a steam consumption of less than 11.8 lb./gall. of crude; subsequent operations have shown a considerable reduction in this figure.

The refinery incorporates the new A.P.V. continuous defronting unit which is stated to be capable of producing defronted benzole containing as little as 1 p.p.m. of carbon disulphide with a very low loss of benzene in the overhead fronts. The unit has the advantage of accurate control over a wide range of variations in feed composition, consistent and predictable vapour/liquid contacting and also the ability to deal with large throughputs in a single column.

Because of the high degree of control available, the defronting unit will reduce the sulphur content of the defronted benzole to the desired value between 0.02 and 0.0005% sulphur as CS_2 with a steam consumption of less than 11.8 lb./gall. These results are obtained with an overhead fraction representing 1½ to 2½% of the feed material, dependent on the characteristics of the crude.

Particular features of the plant developed by A.P.V. are understood to comprise a direct contact condenser in which ascending vapours are partially condensed by counter-current contact with a large quantity of cooling water at controlled temperature; and the use of an A.P.V. West plate column with injection of open steam to the base.

This new benzole refining unit of Appleby-Frodingham Steel Co., is the second supplied to the company by A.P.V. The first, erected in 1940, processed over 38 million gall. of crude benzole and has now been superseded by this latest plant, which has twice the capacity of the first plant.



Principle of the A.P.V. benzole defronting process. Alternative plant arrangements are available

Market Report for Copper Oxychloride

A study of the world market for copper oxychloride has recently been carried out by Kemp's Bureau of Trade Research Ltd., 25 Abchurch Lane, Cannon Street, London E.C.4. The cost of the survey is £10.

New-type Distillation Plant Needs No Chemical Treatment of Sea Water

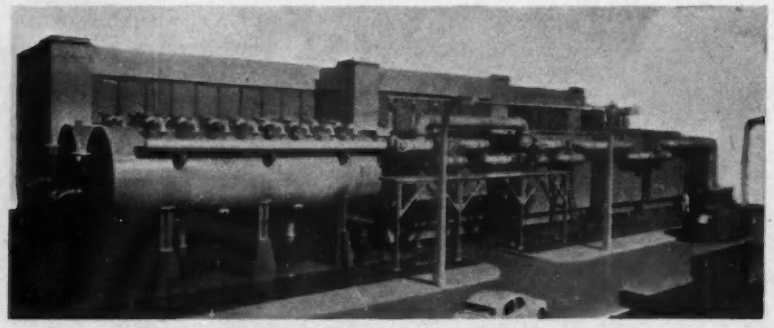
A NEW type of single unit distillation plant, capable of producing 1.2 m. gall. of fresh water daily from sea water, or sufficient for a town of 25,000 people, is being built by Buckley and Taylor Ltd., Castle Iron Works, Oldham, for installation at a Shell refinery at Cardon, Venezuela. One of the main features of the plant is that scale formation will be minimised and no chemical treatment of the sea water feed will be needed.

Said to be the world's largest plant of its type and to constitute a 'breakthrough' in distillation techniques, it is being manufactured under the trade name Aquaflash. A scale model of the plant was seen by Mr. F. J. Erroll, Minister of State, Board of Trade, when he toured the factory on 12 February. Its output will be approximately one-tenth of the world's present land-based sea water distillation capacity.

The plant will occupy a space roughly 165 ft. long by 20 ft. wide, by 16 ft. high. Its eight condensers, each weighing about 14 tons, will contain 83 miles of condenser tubes. Sea water will be fed into the plant at the rate of over 5 million lb. an hour.

Basic principle of the process is that heated sea water is sprayed into a vessel which is maintained at a low pressure. The water boils instantly and the steam 'flashes' off. The plant will consist of a number of flash vessels in series, maintained at progressively lower pressures corresponding to the successive falls in temperature of the brine.

Buckley and Taylor Ltd. are members of the Brightside Group.



Model of 1.2 million gall./day distillation plant

SAFE METHODS IN CHEMICAL PLANT OPERATIONS

ACCIDENTS have been defined in many ways, the two apparent favourites being an unexpected event, or an event which ought not to have happened. The definition which is chosen depends usually on whether the particular result is pleasant or unpleasant.

An analysis of the accidents and dangerous occurrences taking place in chemical works and for which chemicals might be said to be responsible shows that they fall into clearly defined classes. The most important are explosions and pressure bursts; accidents caused by leakages from plant; accidents caused by chemicals being in places where they should not be, e.g. residual solvents in drums. These may not cause injury to personnel.

Most chemical reactions can, if not kept under control, introduce some hazard and therefore it is clear that the element of a 'calculated risk' is always present. Before taking a chemical plant into use, then, it is important to make as complete an assessment as possible of this risk so that the plant can have been so designed and protected that the risk is as far as is humanly possible eliminated. It has been said that the safety policy of a chemical plant should be worked out during pilot plant operation, but this view is, in the writer's opinion, erroneous. It should be possible to make a fairly accurate assessment of the hazards of a process before the pilot plant working is started—the pilot plant operation providing the final 'editing' of the safety plan for the finished plant.

Cost of Safety

The Question of Cost. In trying to assess the hazard the question of cost should not be considered at the start. Chemical manufacturing is usually worked out on a cost basis and the safety arrangements should be drawn up with this in mind. This does not mean that the cost of safety is to be allowed to soar to such an extent that the process is priced out of the market. It may so be that the 'safe' efficiency, i.e. the set of working conditions which produces the least hazard and requires, for example, the least amount of uncomfortable protective clothing to be worn—may not be the most economical efficiency figure. It should be possible to arrive at a figure which will provide good working conditions and a reasonable profit. At some period in the design of a plant, it is clearly desirable to assess the probable cost of plant safety and to attempt to offset this against the cost of accidents which good safety practice could obviate. This can only be done by a study of accident frequencies in relation to cause, and even when reliable figures are available the assessment is not an easy task.

Assessing Hazards. To try to assess the hazard picture of a chemical process, it is essential, as a first requirement, that a complete materials balance is prepared. This should include all impurities present in the raw materials. The effect of small amounts of 'impurities', as will be shown below, can be at times serious and at times beneficial.

The writer has on occasions when examining a competitive product formed the opinion that some particular effect, e.g. degree of emulsification, has possibly been achieved by the use of a commercial product containing a small amount of some substance which would be removed by purification, in place of a more refined product. Again, one has only to consider modern trends in agricultural science to realise the value of trace elements. Just as they are valuable, they can also be harmful. The Chemical Works Regulations quote the development of arsene during the action of certain acids on metals. This has happened in the use of chemicals for cleaning the tubes of boilers. A further example which occurred in the writer's experience was the use of a very slightly saline water in relatively small quantities for process dilution. This finally resulted in a very enhanced corrosion effect on certain materials of construction. In this case the impurity was present in amounts of the order of 2 p.p.m. as a maximum. Such quantities present difficulties far greater than the amounts would suggest and require special treatment.

The impurity, if suspected, may be difficult to detect. Its removal by physical or chemical methods could be difficult. Even if it were gaseous it is doubtful if such a small amount could be removed by heating. Over a period the amount tends gradually to build up until it reaches a point where its concentration is sufficient, as in this case, to cause a very rapid corrosion with the subsequent weakening of the wall of a vessel. The effect of trace elements in various fields and their effect on the progress of some chemical reactions is now more clearly understood. The surest way to guard against effects of this type which may occur so unexpectedly as to become a hazard, is a rigid control of the quality of all the raw materials. If such a trace element is suspected it must be carefully watched.

Effect of Side Reactions. The preparation of a materials balance may suggest possible side reactions which, although only occurring to a relatively minor degree, can have an effect which is out of all proportion to their quantity. If, say, the products of such a reaction are gaseous, the usual rules governing the solubility of a gas in a liquid will apply. When the amount of gas produced is greater than the liquid reacting mixture can dissolve, there will be an effervescence. If insufficient space has been allowed for such an efflux of gas, it may mean that in the case of a viscous liquid, part of the charge comes over the side of an open vat, or if a closed vessel is being used, up the fume duct. If a batch process is being operated, the effervescence may take place at any time during the reaction, as the composition of the mixture in the reaction vessel will be continually changing. In the case of a continuous process the evolution of gas, with the possible production of a foam, will take place at some place in the line. Even if the bubbles break and there is no froth formation, the pressure rise may be quite appreciable in the case of a reaction being carried out in an autoclave. In this case, should the safety valve or bursting disc open, the decrease in pressure will usually increase the amount of gas evolution and maybe more froth. If the reacting mixture is

By John Green

The pseudonym 'John Green' masks the identity of the author, an acknowledged authority on the safe handling of chemicals. Among the points he makes are:

- **Study of accident frequency in relation to cause will help safety arrangements to be drawn up with a cost basis in mind.**
- **Even simple side reactions can produce possible hazards and there is no excuse for overlooking their possibility.**
- **Danger to watch when air-stirring is surging caused by too quickly opening air valves; overfilling of vessels can lead to spillage.**
- **Safety margin in vessels—probably about 20 per cent of free space—should not be a matter of guessing ; it can quite readily be calculated.**

Safety in the Chemical Industry

such that a permanent foam is produced, its dispersal can be difficult.

A simple side reaction can produce a possible hazard, but there seems no excuse for a failure to detect the existence of such reactions in the early stage and, having found their existence, to arrange to counteract any undesirable effects.

Batch Reaction Rates. The rate at which batch reactions proceed may vary considerably and the writer well remembers handling a plant for the manufacture of nitric acid in which the nitrate and sulphuric acid were charged into a pot and a large producer gas burner lit underneath. As might be expected, as soon as the charge heated up sufficiently, there was a fairly rapid evolution of nitric acid, but sometimes quite a rapid evolution of acid occurred towards the end of the process at a time when one would have expected that the rate would fall off. The probable cause of this was that the mixture was unstirred and a pocket may have developed. In circumstances like this it is essential, on the grounds of safety, to ensure that there is adequate tank capacity to cover such surges.

Overflow Arrangements. The deciding factor is really whether or not the plant can be stopped completely and quickly. This is almost impossible with some processes and, especially in the case of inexperienced workers and supervisors, the likelihood of a tank overflowing may cause a 'minor panic' which should at all costs be avoided. The easy answer is always to have an empty tank into which flow can be diverted.

Free Space

This question of spare space occurs often in chemical plant. There are still quite a number of processes, particularly batch processes, where some form of air-stirring is in use. When the air-stirring is first turned on, there may be quite a surge on the surface of a liquid, especially in the case of slightly viscous liquid, which disappears after the stirring has settled down and become uniform. This surge could—and in this case again the writer can speak from experience—cause quite an overflow of liquid on to the floor if the vessel has been overfilled. The basic cause of this surge seems to be that the air valve is opened too quickly. This is not surprising in the case of an inexperienced worker, who will not fall into this trap twice. The obvious way to avoid a spillage of this sort is to allow sufficient space for it to take its course. If this is not practicable there is the alternative method by arranging that the air pressure can only develop slowly. This can be done either by inserting a construction in the air pipe downstream of the valve or selecting a valve of such a design which will only open slowly. The chance of obtaining such a volume surge should also be explained to all who may have to use air-stirring. The same trouble can arise in the case of a stirrer which creates a vortex. If a vortex is formed by the action of a stirrer, it stands to reason that the liquid which was in the vortex must of necessity build up at the sides of the vessel.

Calculating the Safety Margin. When reading about reactions which are carried out in vessels under pressure, it is often stated in the description that a free space of 20% or some other round number should be left to allow for expansion and any development. This figure is doubtless achieved in some cases by the simple process of guessing. There seems no reason, if the full materials balance of a process has been made and its reaction completely understood, why the actual pressure conditions in the pressure vessel may not be calculated. In such a case it is also necessary to remember that liquids expand with a rise in temperature. Having determined or calculated the changes in volume which will take place, the spare space which will be required can be calculated from the design and working pressures of the vessel concerned.

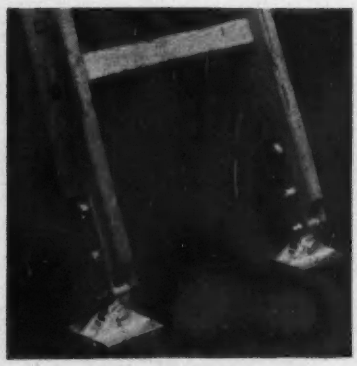
Dangers from Impurities. The possible effect of side reactions has already been mentioned as an indication of effect of small quantities of impurities. The presence of small quantities of impurities which may give rise to toxic products may produce concentration of, say, vapour or dust which are higher than the accepted limits for continuous exposure. These may be unsuspected as the toxic limits for continuous exposure are frequently below the threshold of detectable odour. Operations which are not normally regarded as hazardous may on examination be found to carry one of these elusive hazards. A case came within the writer's experience some time ago in which a very small proportion of a toxic powder was being mixed with an inert 'filling' and the resultant product filled into smallish paper bags (up to 7 lb.) The filling was done under adequately ventilated chutes but when the bag was removed from the chute for sealing, the ventilation was not effective enough to draw all the dust, quite a small amount, which arose during the bag-sealing operation, up the chutes. The amount of exposure must have been extremely small and it was obvious that the employers had taken considerable care in the arrangements made. This small degree of exposure had, over a period of years, produced ill effects on the employees.

'Chemical Age' Survey of New Safety Equipment and Apparatus

AUGUR SAFETY LADDER FEET

AUGUR safety ladder feet, distributed by **Vulcascot (Great Britain) Ltd.**, 87/89 Abbey Road, London N.W.8, are self-aligning and can be fitted to all ladders. Requiring no adjustment they are fitted with oil-resistant, ribbed, non-slip rubber pads. This type of self-aligning feet was adopted because it was felt that ladder feet that need adjustment increase the risk of slippages by luring users into a sense of false security. The ribbed rubber pads are stated to overcome the difficulty of suction cups that do not adhere to uneven floors, or which have to be prised loose from smooth surfaces when the ladder is moved.

Augur ladder feet comprise steel brackets for bolting to the feet of wooden or metal ladders with uprights of 1 in., 1¼ in. or 1½ in. thick. Simple adaptors can be supplied for standard types of metal ladders. Intermediate universal links allow the ribbed pads to rest flat on the floor at all working angles; they also align the pads on uneven and sloping floors.



Safety ladder feet

The company's Vulcascot rubber conduit strip, introduced last spring, is now available in oil-, acid- and heat-resistant grades of synthetic rubber to obviate deterioration in industrial use. Safety officers and others, who place an initial minimum order of 30 ft. for special requirements, can have new sections of strip designed and made with non-standard size tunnels.

SENSITIVE LEAK DETECTOR

TYPE THM 105A leak detector made by la Compagnie Française Thomson-Houston is designed to detect leaks in equipment which, for efficient and safe operation, requires to be completely sealed. A few such items are nuclear equipment, physics apparatus, semi-conductors, distillation and refrigeration equipment, pumping installations, heat exchangers, condensers and boilers.

The instrument is based on the principle of detection of helium gas by a miniature mass spectrometer. It is claimed to be the world's most sensitive instrument for the detection of leaks, being capable of detecting, locating and measuring leaks as small as 10^{-12} cm³ per second. To enable detection to be achieved the proportion of

helium required in any other gas is as little as one part in 10 millions. Moreover the response time is extremely rapid, and the power consumption is only 800 watts.

A unique feature of the model is a spectrometric chamber which employs double deflection of 180° enabling great stability of operation and a high sensitivity to be obtained. A distinct advantage of this instrument is the incorporation of two pumping units in the vacuum circuit. The first is a two-stage mechanical pump of high capacity; the

A batch of slugs being introduced into a cylinder for testing for leaks, using the C.F.T.H. leak detector

second is a silicone oil vapour diffusion type cooled by compressed air. This pumping assembly maintains a very low pressure in the test cavity which is capable of being reduced to below 10^{-6} millimeter of mercury.

A helium flowmeter, controlled helium jet and a helium sensing probe are additional features of this instrument and provision is also made for remote indicating meters and audible alarms.

Full specification and details of this leak detector are available from **Leland Instruments Ltd,** Abbey House, Victoria Street, London S.W.1, sole distributors for the U.K., Commonwealth and Empire.

HYDROGEN-PALLADIUM DIFFUSION

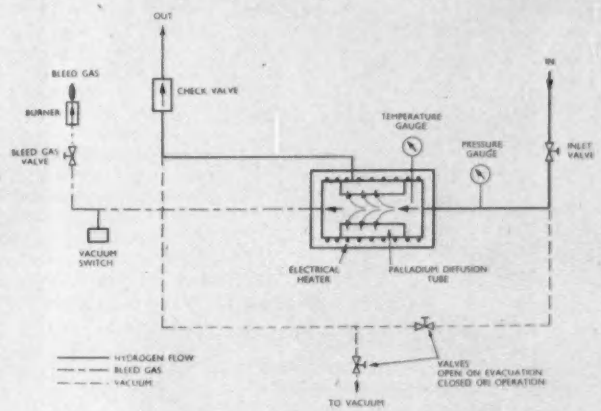
MODEL HPD 5 hydrogen - palladium diffusion purifier, shown by the Baker Platinum Division of **Engelhard Industries Ltd.,** 52 High Holborn, London W.C.1, at the 1960 Physical Society Exhibition, has been designed to eliminate the many hazards involved in the use of palladium diffusion tubes. The unit has a tube of known wall thickness and surface area maintained at a constant temperature of 325°C. Three of the four major variables that govern the rate of diffusion of hydrogen through a palladium membrane are constant and the rate of diffusion may be adjusted by altering the pressure drop across the tube.

The purifier will produce up to 5 cu. ft. an hour of ultra-high purity hydrogen with an inlet pressure of 410 p.s.i. Units can be designed for the purification of up to 50 cu. ft. an hour. A series of electrical interlocks prevents hydrogen from contacting palladium during heating or cooling throughout a critical temperature of about 150°C, which would lead to rapid deterioration of the metal.

Impurities such as water vapour, oxygen and nitrogen liable to be found in cylinder hydrogen do not accumulate on the high pressure side of the tube but are bled out by a controlled flow of impure hydrogen and are either burned-off or vented to atmosphere.

Engelhard Industries can also supply palladium diffusion tubes separately.

Safety in the Chemical Industry

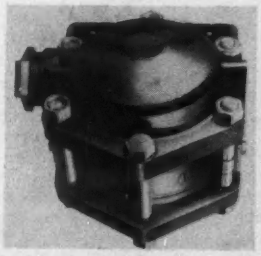


Flow diagram of Model HPD5 hydrogen palladium diffusion purifier

STABLES BELLOWS-TYPE FLOWMETER

A NEW bellows-type flowmeter featuring automatic temperature and static pressure stabilising is now being manufactured by **Honeywell Controls Ltd.,** Ruislip Road East, Greenford. It will operate efficiently with ambient temperatures between −40°F and +250°F and incorporates a rapid pulsation damping device.

Also suitable for liquid level measurement, the instrument has an accuracy of +0.5% full scale differential pressure.



Bellows-type flowmeter

Fifteen ranges from 0-20 in. water to 0-400 in. water are available. The flowmeter can be used with integrally-mounted or remote-reading indicators, recorders or controllers. Automatic flow totalising on a six-digit counter can be incorporated.

The bellows and all parts of the bellows assembly exposed to process fluid are of stainless steel. Full details are contained in specification sheet S292-2a.

NON-CONDUCTING PAINT BRUSH

ONE of the safety advantages claimed for the new all-plastics painting or cleaning brush introduced by **Webb, Jarratt and Co. Ltd.,** Townsend Road, Chewham, Bucks, is that it is electrically non-conducting. Resistant to many chemicals, it has no metal parts. Filling is of pure China bristle set in insoluble epoxy resin. Available in assorted colours, the price per dozen is 35s.

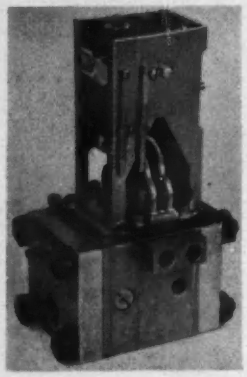
E.I.L. GAMMAGRAPH

The E.I.L. Gammagraph is said to be the first instrument developed to measure continuously the fall-out of gamma radiation indoors or outdoors, such as in the vicinity of a nuclear power station. Powered by an ordinary car battery it is completely weatherproof. Manufacturers are Electronic Instruments Ltd., Richmond, Surrey

F. AND P. PRESSURE TRANSMITTER

MODEL 1465 differential pressure transmitter has been added to the range of flow-metering instruments of **Fischer and Porter Ltd.,** Salterbeck Trading Estate, Workington, Cumberland. It is used to convert a differential pressure to a proportional pneumatic output signal of 3-15 p.s.i. for the operation of remote flowrate indicators, recorders or con-

Safety in the Chemical Industry



Differential pressure transmitter

trollers. Of a force-balance type with continuously adjustable damping, and built-in over-range protection, it is temperature compensated.

Range of the instrument is continuously adjustable from 0-20 in. to 0-200 in. water gauge. By inverting the range adjusting nut, the range can be increased to accommodate to 0-30 in. to 0-300 in. water gauge. Accuracy is 1% of full range. With a stainless steel body of through-bolt construction, the instrument's working parts are enclosed in a glass fibre cover. A specification leaflet is obtainable.

SWIVEL FACE SHIELD A NEW version of the FV 8 heavy duty face shield is announced by **Pyrene-Panorama Ltd.**, Windmill Road, Brentford, Middlesex, designed to achieve greater ventilation and improve de-misting properties.

An aluminium strip, swivel-mounted

New version of FV8 shield

on the screw-adjustable head harness, carries a heat-reflecting, clear or coloured acetate 'Celastoid' screen which can be supplied in 6 in., 8 in., 10 in. or 12 in. depths. The harness on the FV 8 model has been retained, and incorporates a patented screw adjusting device.

PYRENE'S NEW FIRE-FIGHTING EQUIPMENT NEW fire-fighting appliances, designed to combat fires involving highly inflammable liquids and substances, have been introduced by the **Pyrene Co. Ltd.**, 9 Grosvenor Gardens, London S.W.1, after extensive research and development. This new range extends from dry chemical extinguishers of 5 lb. capacity to 25 lb. capacity and includes a 150 lb. capacity dry chemical wheeled unit and a new foam extinguisher of advanced design.

Smallest of the new dry chemical extinguishers is the Pyrene P.D.5 Mark II. New in conception, simple to use and of the pre-pressurised type, it contains 5 lb. of Pyrene dry chemical and has a weight when charged of 11½ lb. The most effective jet length for this model is 14 ft.

Designed to fight extensive open fires involving highly inflammable liquids or substances, the Pyrene P.D.150 Mark III dry chemical wheeled unit contains a 150 lb. charge and can be operated by one man. The charge is expelled under pressure provided by a cylinder of CO_2 gas through a 30-ft. high-pressure hose of 1-in. bore, fitted with a 'squeeze-grip' control valve and fan nozzle at the end of the line. It discharges dry chemical for 45 seconds and the operating temperature range extends from −4°F to +140°F. Weight of the unit fully charged is 340 lb. A similar model, employing Pyromet dry chemical, is capable of dealing with fires involving burning metals.

Producing an effective fire-smothering foam even in wintry conditions, the Phomene Model M.P.F. mechanical foam fire extinguisher embodies a number of advanced design features. The main container is charged with water and foam compound in solution and pressurised with nitrogen or air. The operating head, which houses the release valve and a built-in pressure gauge, is fitted with a pivoted carrying handle and a valve-operating lever.

A special plastics lining prevents corrosion; the foam-making branchpipe is of nylon construction. The discharge of from 14 to 18 gall. of foam continues for 28 to 38 seconds. Weight is 31½ lb. fully charged.

Industrial Accidents Equivalent to Total I.C.I. Labour Force Off Work for Year

JUST under 20 million man-days a year are lost through industrial accidents, including occupational diseases. That is equivalent to a trained labour force of 80,000 people—the total labour force of I.C.I.—off the job all the time. This figure, the average of the past of the last five years, was quoted by Sir William Garrett, chairman of the Association of British Chemical Manufacturers, and a director of Monsanto Chemicals Ltd., when he responded to the toast of 'The Guests', at the annual dinner of the Chemical Engineering Group, Society of Chemical Industry, at the Cafe Royal, London, on 5 February. Mr. E. W. Greensmith (I.C.I.), section chairman, who presided and proposed the toast. Mr. G. N. Hodson (Hathernware Ltd.), vice-chairman, proposed 'The Society'.

Time lost through all strikes in the last five years had been just under 5 million man-days a year. That, said Sir William, gave some idea of the size of the accident problem. It should not be forgotten that the removal of one man by accident usually lowered the efficiency of the team with which he worked.

Speaking on safety as a company policy, Sir William thought the industry had reached the point where further progress was difficult to achieve. Was this, he asked, due to a fundamental approach to the problem? The industry was prone to regard safety work as something outside the normal line of duty so that a good safety record was something for which they expected to get a pat on the back.

That attitude was hindering further progress. Safety should be regarded as a normal requirement. The ultimate responsibility for safety lay squarely on the shoulders of management; the roots of safe operation lay in company policy. Safety in industry was not an 'extra' that could be superimposed on other operations, neither could a good safety record be maintained by campaigns, for spasmodic treatment could not achieve good results and might in the long term hamper efficient working. Due regard to safety was unlikely unless top management accepted responsibility for it as it accepted responsibility for the efficient performance of production.

Safety had to be built-in as part of company policy and must be considered at all stages of a project. When research was in hand, full consideration must be given to possible fire and explosive hazards, also to corrosion problems, and to possible cumulative toxic effects on operators. So much attention had to be given to so many safety points that the closest collaboration with production and safety staff was essential.

It was better and cheaper to make mistakes on paper at that stage than to rectify faults during construction, or, worse still, after construction.

When the operating manual was being compiled it must be written in such a way that it was easily understood by the man who would have to operate the plant. It was vital that the manual should not be capable of being misunderstood.

Probably the most important factor in safety was the training of workpeople; not only the training of new entrants, but continuous training by supervisors was necessary for all workpeople. Those under instruction should not get the impression that safe practice was any less important that skilful performance.

Reiterating the role that management had to play, Sir William added that regular inspections should be carried out by management and not left to the safety officer, who was not responsible for the safe operations of a plant, but whose job it was to advise management.

Overseas News

TWO NEW PROJECTS WILL BOOST U.S. CAPACITY FOR STYRENE MONOMER

A 70 MILLION lb./year styrene monomer plant is to be built at Houston, Texas, by Sinclair Oil and Koppers. To own and operate the plant, these companies are to form a jointly owned company.

The plant, which is expected on stream by mid-1961, will separate ethyl benzene, raw material for styrene, from an aromatics stream produced at Sinclair's Houston refinery. Koppers will use and market the new plant's styrene output.

Cosden Petroleum have also announced that their styrene output is to be tripled to 60 million lb. annually. At present the company uses ethyl benzene for its styrene production, obtained directly from a mixed-xylene stream by superfractionation. For its expanded capacity, however, the U.S. commercial Alkar unit will be operated. Benzene from Cosden's BTX plant will be used. This will be ethylated in a fixed-bed catalysis system with ethylene recovered from residue gas of a cracking unit.

Contract for the design, engineering and construction of the entire styrene expansion project has been awarded to Badger Manufacturing Co. The planned increase in styrene monomer production is committed through long-term sales contracts or to the company's own needs. At present the 20 million lb. styrene output is polymerised and marketed in pellet form in bulk.

German-Indian Link for New Chemicals Producer

The newly-formed firm of Sarabhai-Merck Ltd. have opened a plant in Baroda, India, for the manufacture of chemicals and pharmaceuticals. The operating company is a joint subsidiary of the Indian textile concern, Sarabhai, and E. Merck AG, pharmaceutical and chemicals producers, Darmstadt, West Germany.

Chemicals and Chemical Plant at Leipzig Fair

Raw materials, chemical products and chemical plant occupy a prominent place in this year's Leipzig Spring Fair, to be held from 28 February to 8 March. The U.K., the Soviet Union, Federal Germany and the host country will be among the leading exhibitors in the chemical field. The East German chemical plant industry will show a plant for the preparation of 360 kg. of liquid oxygen per hour, with upright air compressor and purity level for recovered oxygen of 99.6%; an installation for the recovery, purification and liquefying of carbon dioxide from fermentation residues, designed for use in distilleries and breweries; a high-capacity thrust centrifuge with an output claimed to be nearly double that of existing units of similar types; a trough mixer for the mixing of synthetic-rubber-based plastic masses and for the decomposition of raw synthetic rubber.

Methyl Alcohol Types from Chemische Werke Hüls

The Marl, West Germany, chemical producers Chemische Werke Hüls AG, are offering a range of uncommon methyl alcohol types in laboratory quantities. All are colourless, immiscible and are soluble in all organic solvents. They are: methyl-propyl-carbinol (n-pentanol-2); methyl - (1 - methyl) - propyl - carbinol (3 - methyl - pentanol - 2); methyl - pentyl - carbinol (n-heptanol-2); methyl-(3-ethyl)-pentyl-carbinol (5-ethyl-heptanol-2); and methyl-(3-ethyl)-heptyl-carbinol (5-ethyl-nonanol-2).

New Polythenes Resist Dust Attraction

Two new polythene compounds have been developed which, it is claimed, for the first time eliminate dust attraction by injection moulded articles. Available from the Plastics Department, Union Carbide International Co., 30 East 42nd Street, New York, the new materials are designated DNDA-0401 and DPDA-7366. They do not retain the electrical charge that attracts dust.

China Raises Output of Fertilisers by 64%

Some 1,330,000 tonnes of synthetic fertilisers were produced in mainland China last year, an increase of 64.4% on 1958.

Goodrich Plan Polyisoprene and *cis*-Polybutadiene Plant

Polyisoprene and *cis*-polybutadiene are to be made on a commercial scale in a 25,000-ton-per-year plant to be built by Goodrich Gulf. Sites under consideration are at Orange County, Texas, and Institute, W. Va. Advanced engineering work is stated to be under way, and the plant is expected to be operating in late 1961.

International Oil-line Planned in Plastics Material

H. and G. Meister AG, Zurich, have received an order from the Munich office of the Getty group to draw up plans and estimates for the laying of a pipeline from Nuich to Trieste in their glass-fibre reinforced Polyverit material. Polyverit has a specific weight of from 1.5 to 1.8, heat resistence of from 250 to 300°C, a resistance of from 4,500 to 5,500kg. per sq. cm. and an operating pressure for pipes of from 25 to 30 atm. Meister also state that they may, in co-operation with their West German office, set up a factory in the Munich area where piping and other products from Polyverit would be manufactured under licence.

Texas Gulf Plan New Sulphur Plant

Plans for construction of a plant for treating sulphur by filtration have been announced by Texas Gulf Sulphur Co. The plant will be located at the company's Spindle Top mine, near Beaumont, Texas. Completion is scheduled for midsummer, 1960.

Synthetic Rubber Plant Part of Indo-Soviet Agreement

India will build a synthetic rubber manufacturing plant under a Rs85 million Indo-Soviet agreement covering the construction in India of plants to manufacture medical and surgical implements.

According to Mr. E. R. Valashik, director of the Moscow Institute of Pharmaceuticals and a member of a five-man Soviet delegation of pharmaceutical experts now touring India, Hyderabad has been selected as the site for the plant. (See also CHEMICAL AGE, 23 January, p. 172.)

French Firm Completes Plants in India

Soc. Krebs et Cie, France, have completed installation, for the Dhrangadhra Chemical Works at Sahupuram near Tuticorin, of a caustic soda plant of 30,000 tons/year capacity and of a sodium carbonate plant at Dhrangadhra in Saurashtra.

Philippines Offered W. German Chemical Plant

A West German offer to donate a chemical plant as a contribution to the economic development of the Philippines has been accepted, it is reported. The plant is to serve as a training centre for local technicians and for research on production.

Urea Plant at Ravenna

Nuovo Pignone of Florence have delivered the first of the three 4HDC/4 compressors which A.N.I.C. have ordered for their urea plant at Ravenna.

Eastman Inhibitors to Protect Polymers from Degradation

Available in development quantities from Eastman Chemical Products, Inc., Kingsport, Tennessee, U.S., are HPT (hexamethyl-phosphoric triamide) RMB (resorcinol monobenzoate) OPS (*p*-octylphenylsalicylate) and THBP (trihydroxybutyrophenone). The first three are stated to be ultraviolet stabilisers and the fourth an antioxidant for polyolefins and paraffin waxes.

HPT, a clear liquid, is recommended for vinyl plastics. Eastman claim that

it has protected polyvinyl chloride against degradation for seven years. RMB has proved successful in cellulose plastics. White OPS is suggested for use in polythene and polypropylene, and is compatible with resins.

Polythene with 0.1% THBP, Eastman say, is some 2½ times more stable to oxidation than a control sample without THBP.

Forecast on U.S. Titanium Dioxide Production

According to a long-range forecast by the *Oil, Paint and Drugs Reporter*, U.S. production of titanium oxide could reach 822,000 tons in 1970, some 342,000 tons above the expected 1959 level. The estimated output for 1960 is put at more than 504,000 tons.

World capacity for titanium dioxide in 1959 was 725,000 short tons, it is stated. By the end of 1960, this figure is expected to have increased to well over 1 million tons.

Italian Natural Gas Production Higher

According to the Italian State holding company E.N.I., Italian natural gas output totalled some 5,700 million c. m. last year. This figure is higher by some 12% than that for the previous year.

Dechema Annual Meeting

'Werkstoff-problem in der chemischen technik' is the subject for the 1960 annual meeting of Dechema (Deutsche Gesellschaft für chemisches Apparatewesen) which will take place from 14 to 16 June in Frankfurt. This will also be the 26th meeting of the European Federation of Chemical Engineering. Papers will deal with the properties of non-metallic protective coatings; electrolytically deposited metal layers; corrosion inhibitors; and laminated materials of construction.

Applications to read 15-minute papers should be sent to Dechema, Frankfurt (Main) 7, Postfach, by 1 March.

Bayer Purification Plant

Farbenfabriken Bayer AG, Leverkusen are to start the erection of a central water purification plant, probably during 1960. Cost of the first stage of the installation, which will come into operation in 1965, it is thought, will be some £1.75 million. The whole scheme, divided into three building phases, will involve alterations to the mouths and courses of two rivers.

Rumanian Plans for Polyamide Acrylic and Polyester Fibres

According to official sources Rumania should be producing 15,000 tonnes of plastics by the end of 1960. By the end of 1962 some 7,000 tonnes of various kinds of synthetic fibres will be produced annually, including Relon (polyamide), Rolan (acrylic) and Teron (polyester).

During 1960 the Uzinele de Produse Sodice plant, now fully modernised, is to take up production of 200,000 tonnes a year of ammoniacal soda, this capacity later to be raised to one of 300,000 tonnes. A plant for synthetic rubber is to start with a capacity of 25,000 tonnes, which will later rise to 50,000 tonnes per year. Plants in the Rumanian chemical industry recently brought into operation or planned for the near future include units for the production of phenol, acetone, acetic acid, acetic anhydride, the higher alcohols, softening agents, detergents and solvents.

Italian Shell Company to Build Solvents Plant

The Italian company of the Royal Dutch/Shell group is to erect a plant for the extraction and cracking of aromatic solvents at Rho, near Milan, on the site of the Condor oil refinery. The plant is expected to come on stream in mid-1961 with an initial annual output of 100,000 tonnes.

Fish International's Synthetic Rubber Plans for Argentina

The U.S. concern Fish International plan to build a plant for the production of synthetic rubber and petrochemical products in the Argentine. Cost of the plant is given as some $60 million.

National Polychemicals Develop Light-coloured Phenolic Resin

Development of Poly-Phen S-218, an entirely new phenolic resin for use in light coloured compounds based on natural rubber and styrene-butadiene copolymers, is announced by the plastics division of National Polychemicals, Wilmington, Mass. The new resin, compared with resins presently on the market, is stated to impart substantially light colour and better colour stability while also providing good reinforcement. The resin is reported to develop a high degree of hardness and stiffness of most moulding compounds without increasing the specific gravity of the vulcanisate.

National Polychemicals are marketing this resin in uncatalysed flakes and powder, as well as a catalysed powder. Poly-Phen S-218 is especially recommended in compounding of composition soles, top lifts and miscellaneous mechanical goods.

Chemical/oil Merger Denied

The Homberg, West German, coalmining and chemical manufacturing concern Rheinpreussen-AG für Bergbau und Chemie has denied reports that it is to merge with the Hamburg-based mineral oil concern Deutsche Erdöl AG. The company, which has a holding in the Ruhrchemie chemical concern, has a good share in the West German hydrocarbon chemistry industry. It is expecting a dividend for the 1959 financial year of 8% (7%).

I.C.I. to Supervise First P.V.C. Plant in Argentina

I.C.I. chemical engineers will supervise completion and commissioning in March of the first p.v.c. plant to be built in the Argentine. The factory, in the province of Sante Fe, was constructed by Electroclor, an Argentine associate of I.C.I.

Carnegie Institution's Synthetic Diamond Process

Using a pressure of 1.1 million p.s.i. and a temperature of 2,700°F, the Carnegie Institution of Washington, have succeeded in producing synthetic diamonds.

The diamonds, which are black, form aggregates of crystals, the largest noted measuring about 0.004 in. Catalyst used in the process has been molten nickel, one of the metals reported by General Electric as effective in their synthetic diamond process.

Becco's Epoxy Process Produces Peracetic Acid and Helps Cut Costs

PRODUCTION of epoxy fatty acid esters from such abundant raw materials as soyabean oil, oleic acid and tall oil esters is possible using a new process developed by Becco Chemical Division of Food Machinery and Chemical, U.S. These epoxy esters make good plasticisers and stabilisers for vinyl resins.

Patent U.S. 2,919,283 reveals an easy, economic route to epoxies. Main feature of the process is the production of peracetic acid. Acetic acid, hydrogen peroxide as oxidant and an ion exchange resin as a catalyst are used. A controlled ratio of acid to hydrogen peroxide is used in the presence of a sulphonic acid cation exchange resin. Peracetic acid forms from the mixture, reacts with an unsaturated compound, such as oleic acid, to make an epoxy derivative. The hydrogen peroxide added is used up in the reaction.

Factors in the low cost of the process are that peracetic acid is made in the reactor from two cheaper materials and that only a small amount of catalyst is required—only 1% to 2% of the combined weight of peroxide and acetic acid. Catalyst cost in any event is estimated at less than half a cent. A further advantage is that no special apparatus is required.

Where it is not required to re-use the catalyst, the unsaturated material acetic acid and catalyst are mixed and warmed to 60°C. A 50% solution of hydrogen peroxide is added over a two-hour period at 60°-65°C. The reaction is stated to be completed at 75° to 80°C.

A method in which the catalyst resin can be re-used is described in the patent. To accomplish this some extra steps are involved to protect the resin from attack by the oxidising medium. The effect is stated to be due to metal impurities in the resin. The catalyst is therefore pretreated to get rid of metals and a metal-sequestering agent is added to the reaction mixture. The resin is also stated to be more highly cross-linked.

PEOPLE in the news

● **Dr. Hugh Reid,** president of I.C.I. (New York) Ltd., has joined the board of Canadian Industries Ltd. In the summer of 1957 he was appointed general manager of I.C.I.'s Severnside project and in October of the same year became president of the New York company.

● **Sir Walter Worboys** has been appointed a director of the Forestal Land, Timber and Railways Co.

● **Dr. J. C. R. Turner, M.A., Ph.D.,** of Trinity College, has been appointed lecturer in chemical engineering, Cambridge University, and **Dr. A. Korner, M.A., Ph.D.,** Trinity College, lecturer in biochemistry, both appointments being for three years with effect from 1 October next.

● **Mr. H. D. Walker,** sales director of Constructors John Brown Ltd. left London by air recently on a visit to Teheran.

● **Dr. A. H. Cook,** director of the Brewing Industry Research Foundation, and **Mr. Michael Perrin,** chairman of the Wellcome Foundation, have joined the board of the Arthur D. Little Research Institute.

Mr. D. G. Furzey, whose appointment as chief engineer with S.D. Plants Ltd. was announced in 'People in the News' on 6 February

● **Dr. H. O. Schild,** reader in pharmacology at University College, London, has been appointed Professor of Pharmacology at the college from 1 October 1961.

● **Dr. James Taylor, M.B.E.,** director of Imperial Chemical Industries Ltd. for Nobel and Metals Divisions, has been elected an hon. member of the Institution of Mining Engineers in recognition of his work when he was a member of the Nobel Division research department. Much of his work was then directed towards producing safer explosives and accessories for use in coal mining.

● **Mr. H. A. D. Perry,** of I.C.I. (Hyde) Ltd., and **Mr. L. D. Stewart,** overseas director, of I.C.I. Paints Division, have joined **Mr. J. D. Rose** as joint managing directors. Mr. Perry retains his appointment as managing director of I.C.I. (Hyde) Ltd., which will be his principal responsibility.

● **Mr. E. A. Howe,** managing director of Film Cooling Towers (1925) Ltd., Chancery House, Parkshot, Richmond, Surrey, will shortly leave for a four weeks business tour of the Caribbean. He will be flying direct to Antigua and expects to visit cooling tower installations in St. Kitts, Barbados, Jamaica and Trinidad.

● **Mr. P. D. Brazier** has been appointed managing director of E. R. Squibb and Sons Ltd., manufacturing chemists, 17 Old Bond Street, London W.1.

● **Mr. A. H. Wilson,** deputy chairman of Courtaulds Ltd., **Mr. C. F. Kearton,** a managing director, and **Mr. W. Gerard Daroux,** director of Group Developments Ltd. and Cellon Ltd., subsidiaries of Courtaulds, have joined the board of Pinchin Johnson and Associates Ltd., following the recent acquisition by Courtaulds.

● **Mr. M. Arnold Kershaw, F.C.S.,** who is to be installed as president of the Institute of Sewage Purification, at the annual conference to be held at Scarborough from 21 to 24 June, is sewage works manager at Rotherham, and the son of the late J. H. Kershaw, a founder member of the Institute.

● **Mr. J. C. Hanbury,** chairman of Allen and Hanburys, **Mr. M. Pearce, C.B.E.,** overseas manager of George Wimpey, and **Mr. R. Wonfor,** sales director of Vickers-Armstrongs, will be among the party of businessmen and industrialists leaving for Cairo on 23 February. Purpose of the visit is the renewal of trading contacts and examination of prospects for increasing trade in both directions between the U.K. and the United Arab Republic.

● First awards in the plan for exchanging technical college teachers with the U.S., include a number of U.K. chemistry teachers who have been selected for a pilot scheme covering eight weeks stay in the U.S. These are: **Mr. D. W. Hopkins,** head, Metallurgy and Chemistry Department, Swansea Technical College; **Dr. J. C. Parkinson,** head, Pharmacy Department, Brighton Technical College; and **Dr. J. H. Skellon,** head, Department of Chemistry and Biology, Brunel College of Technology, Acton, London W.3.

● **Mr. J. L. S. Steel,** who is retiring from the board of Imperial Chemical Industries Ltd. on 24 March, his 60th birthday, has served the company for more than 37 years, during 14 of which he has been a director. In recent years he has been responsible for the company's economic planning, with particular interest in Common Market and Free Trade Area questions. He has been chairman of the I.C.I. Alkali Division, chairman of the British national committee, International Chamber of Commerce (since 1951), and chairman of the overseas trade policy committee, Federation of British Industries (since 1950).

● The services of **Mr. Colin Garrett, F.T.I.,** have been retained by Laporte Chemicals Ltd. in an advisory capacity to their textile technical and customer service organisation. Mr. Garrett, who was previously with Bleachers' Association and Lumsden and Mackenzie Ltd., has considerable practical experience in the fields of bleaching and dyeing, particularly for bleaching processes based on hydrogen peroxide and sodium chlorite. As announced in CHEMICAL AGE, 21 November, p. 731, Laporte Chemicals are about to start manufacturing sodium chlorite as an addition to their range of bleaching products based on hydrogen peroxide. This will be the first U.K. facility for sodium chlorite.

Mr. James Baxter, who has been appointed field sales manager of Griffin and George Ltd., Scottish Branch, 45 Renfrew Street, Glasgow, C.2

● **Mr. G. W. Loynd,** who has been appointed superintendent (new plants) at the Carrington Works, near Manchester, of Shell Chemical Co., joined the Shell Group as a trainee at the Central Laboratories, Fulham, in 1945 on leaving Manchester University. He then worked at Stanlow Refinery as a works chemist until 1949, when he became a technical assistant in head office, London. After training in the U.S., he returned to Stanlow as a technical assistant and was appointed manager, cracking department in 1952. In 1955 and 1956 he worked at Bombay refinery as a section head, and in March 1957, returned to this country to become manager of economics and scheduling department at Stanlow. Since July 1958 he has been departmental manager (new plant) at Carrington.

● Two presentations were made to **Mr. H. Fergie,** chemist, of The Alumina Co. Ltd., Widnes, a few days ago, on his retirement. One was a golf carry-car from the workpeople at the Iron Bridge Works, and the other a set of tools from the Ditton Road Works.

● **Mr. B. A. Richards,** a senior sales representative of the export department of Marchon Products Ltd., a member of the Albright and Wilson Group, left the U.K. by air last week for an extended

tour of the South American continent. During his visit Mr. Richards will meet Marchon's customers and agents in every country in South America, and investigate the prospects for further exports of detergent chemicals from Whitehaven.

● **Lord Hailsham,** Minister for Science, with **Mr. F. F. Turnbull** secretary of his office, visited the Atomic Weapons Research Establishment, Aldermaston, on 15 February. He was accompanied by the A.E.A. chairman, **Sir Roger Makins,** A.E.A. member for weapons research and development, **Air Chief Marshal Sir Claude Pelly**, and the A.W.R.E. director, **Dr. N. Levin.**

● **Dr. E. Parry Jones** becomes chairman of the newly formed Fisons Farmwork Ltd., a subsidiary of Fisons Pest Control. **Mr. R. F. Norman** is appointed managing director, and **Mr. J. A. A. Brown** is general manager. Remaining directors are **Mr. T. A. Coslett, Mr. C. J. Edwards** and **Mr. F. W. Morris.** Secretary will be **Mr. R. G. Westwood.**

● **Mr. H. J. Wyatt, B.Sc.,** a project engineer, of the engineering design department, I.C.I., Billingham, and **Mr. A. D. H. Hingston,** a member of the A.E.A. technical staff at the Springfields Atomic Energy Plant, Salwick, near Preston, have won the Fildes Award and the Ellis Memorial Award respectively of the Institution of Works Managers for 1959.

● **Mr. C. W. J. Flook,** works manager of the Newport works, Imperial Smelting Corporation Ltd., has been elected chairman of the newly-formed Newport and Monmouthshire Branch of the British Institute of Management.

In Parliament

Dyestuffs and Intermediates Under Open General Licence from 5 March

DETAILS of the Government's plans to repeal the Dyestuffs Acts were given by Mr. F. J. Erroll, Minister of State, Board of Trade, during the second reading of the European Free Trade Bill on Monday. As a result of the obligation to eliminate quantitative restrictions, on imports, which were contrary to the rules of G.A.T.T., it would be necessary to abandon the present system of banning imports except by licence of dyestuffs and intermediates. In turn that had led to a decision to substitute tariff protection.

To avoid the admission of duty-free imports from E.F.T.A. countries of dyestuffs already produced in the U.K., it was important to introduce as soon as possible a protective duty on dyestuffs and intermediates imported from all foreign sources. Such a duty would be subject to progressive reductions until at the end of 10 years, dyestuffs could be admitted duty free from E.F.T.A. countries.

These products will therefore receive the same treatment as other chemicals. The amendment of the open general licence operating from 5 March will be introduced in the Commons in due course.

Average Age of Science Advisory Council

Average age of members of the Lord President's Advisory Council for Science is 55.7 years. Two of the members are under the age of 60. This was stated by Sir David Eccles, Minister for Education, in the House last week. He was asked to ensure that membership of the council was kept reasonably balanced between the various ages.

Commitee of Inquiry on Chemical Sprays

Replying to questions about the use of chemical sprays in agriculture, Mr. John Hare, Minister of Agriculture, last week said that the Committee on Poisonous Substances had been strengthened by the inclusion of five outside scientists. In addition a special inquiry was being set up to report to Lord Hailsham, Minister for Science, the Secretary of State for Scotland and the Minister of Agriculture, on the same subject.

Head Wrightson Sign Agreement with U.S.

AN AGREEMENT has been signed between Head Wrightson and Co. Ltd., the Tees-side engineers, and the Belco Division of Bogue Electric Manufacturing Co. of Paterson, U.S., which will enable Head Wrightson to design, engineer and build water treatment and trade waste disposal plants throughout the world, excluding the North American continent.

Belco are well established in this field and by merging the resources of the two companies it will be possible to offer industry the services of an organisation "with both outstanding design experience and manufacturing technique, especially in the field of fully automatic processes." The American company "has installed some of the largest demineralisation plants in the world at chemical plants, oil refineries and at nuclear stations and Head Wrightson's existing interests in these fields will permit them to expand the services they now offer."

Design and manufacture of this equipment will be handled by Head Wrightson Processes Ltd., who have moved to 20-24 Old Street, London E.C.1.

New Chemistry Department for Harris College

A £650,000 contract for the extension of the Harris College of Further Education, Preston, has been awarded to Holland and Hannen and Cubitts (North West) Ltd., Bromborough, Ches.

Market Reports

Good Quantities Move Against Contracts

LONDON Home trading conditions on the general chemicals market have been reasonably active with the main using industries calling for good quantities against contracts. The flow of overseas inquiry has been maintained on a satisfactory scale.

Apart from fluctuations in prices of non-ferrous metal compounds, quotations have continued steady with a firm undertone. Sulphate of copper is 20s. a ton dearer at £83 a ton less 2% f.o.b. Liverpool, while the rates for zinc oxide have been reduced from 10 February; the new prices being white seal £107 10s. a ton, green seal £105 10s. and red seal £102 10s.

The position of the coal tar products is little changed and supplies are finding a ready outlet.

MANCHESTER The past week saw a continued brisk movement to consumers of a wide range of chemicals against contracts. A fair aggregate business has been reported in prompt and near delivery lots. Shipping business has been maintained at a satisfactory level, with plastics materials prominent. The seasonal upswing in the call for fertilisers is developing slowly; basic slag and the compounds are reasonably active sections. Most of the light and heavy tar products are going steadily into consumption.

SCOTLAND The report is again one of continued activity in the Scottish heavy chemical market. Attention has been focused on the possibility of a rail strike and the corresponding effect on the transport position. This has been shown in some sections of industry in regard to the maintenance of supplies, particularly relating to quantities ordered. Otherwise buying has been steady and demands varied with those pertaining to acids and caustic soda being well maintained. On the whole, prices have been firm with little change. The overseas market is still showing considerable interest.

Chemicals Top the Export List at Liverpool

The tonnage of chemicals, drugs, dyestuffs, colours for dyeing and tanning, loaded for export from the port of Liverpool, in the year to 30 June 1959 was 915,092 (1958, 812,038 tons, 1957, 953,580). Arrivals: 1959, 104,652 tons; 1958, 121,051 tons; 1957, 108,081 tons.

The figure for exports is the highest in any category of goods shipped from the port, and does not include salt, 154,659 tons, and soap and oils, and manufactured fats and resins, 234,693 tons.

Progress at New Ardeer Nitric Acid Plant

All the heavy equipment for the I.C.I. Nobel Division's new nitric acid plant at Ardeer is now on site and the last of the six absorption towers has been hoisted into place.

Commercial News

- **Aspro Bid for Griffiths Hughes Accepted**
- **P.G.-Davy United Merger Talks Continue**
- **B.I.P. Suspend Netherlands Project**
- **Lower Costs from New Bowmans' Plant**

Aspro-Nicholas

The offer by Aspro-Nicholas for Griffiths Hughes Proprietaries has been accepted in respect of over 91% of the Griffiths Hughes Ordinary stock, and has become unconditional. In consequence acceptances of the cash offer by S. G. Warburg and Co. have also become unconditional. It is reported that S. G. Warburg will continue to take in late acceptances of the Aspro-Nicholas offer.

British Oxygen

A general increase in home sales of the British Oxygen Co. in the first quarter of the financial year is reported by Mr. J. S. Hutchison, chairman, and this may become greater as the year goes on, he adds.

The considerable improvement in overseas results and the further general development of the group warrant an increased dividend. An interim of 4%, less tax, was paid at the usual time in September 1959 and the directors now recommend a final dividend of 10%, less tax, making 14%

As previously stated (CHEMICAL AGE, 30 January, p. 208), group net profit expanded from £3,334,062 to £4,521,390 in 1958-59.

Fisons Farmwork

A wholly-owned subsidiary of Fisons Pest Control, a new company with the title Fisons Farmwork Ltd., is announced, having its head office at Harston, Cambridge. It will go into commercial operation on 1 March. (See 'People in the 'News', page 332, for constitution of the board.)

Power Gas Corporation

Group net profit of Power Gas Corporation Ltd. for the year ended 30 September was £780,810 (£532,107). Final dividend of 22½%, making 30% (20% including special interim of 5%), is announced. Orders booked during last year totalled £7,750,000 (£9,250,000) but since the end of the financial year these have returned to a satisfactory level. Negotiations with Davy United Ltd. regarding a possible merger are continuing, but no conclusion has yet been reached.

British Industrial Plastics

The final results of the British Industrial Plastics group for the year to 30 September reflect an upsurge of business experienced in the latter half of the period, and this phase is continuing, according to chairman Mr. C. H. Glassey.

Turnover increased to £7,871,653 from £7,217,813. Profit, before tax, was £802,916 (£698,614), or 10.2% (9.7%) on turnover. Dividend, as already stated, is raised by 2½% to 22½%, with the one-for-one scrip issue proposal (CHEMICAL AGE, 23 January, p. 175).

The directors have under review a number of projects and should these be adopted, and when plans for their implementation are complete, it may then be necessary to issue additional capital, Mr. Glassey's report states. Other points by Mr. Glassey include a statement that the research and development department at the chemical plants at Oldbury is being completely reorganised and expanded, first to ensure continuity in the work of improving the technical properties of existing products and secondly to promote long-term research into such newer plastics raw materials as show promise of commercial exploitation.

In South Africa operations have started in the manufacture of resins for the paint industry, but in Holland, due to uncertainties in respect of the economies of the project negotiated with A.K.U., it was mutually agreed that the proposal for a joint venture be put in suspension.

Bowmans Chemicals

Net profit for the year ended 31 October 1959 of Bowmans Chemicals Ltd. was £12,298 (£16,567) and dividend is 10% (same). Fixed assets stand at £130,371 (£143,002) and net current assets at £125,910 (£136,552).

Current trends, states Mr. J. A. E. Howard, chairman, give the company reason to expect that sales in the year 1959/60 will show a further increase. Also the new lactic acid purification plant is producing more cheaply than the old. Higher sales and lower costs should result in "sensible" increase in profits.

Ilford Ltd.

An increase in the final dividend of 1½% to 12½% is announced by Ilford Ltd., photographic material manufacturers associated with I.C.I. This brings the total for the year ended 31 October 1959 to 17½% (16%).

Although the company's turnover exceeded expectations a decrease in the parent's profit was recorded, from £1,612,499 to £1,518,305 (before tax). Consolidated net profit after tax was £805,624 (£752,316).

Canadian Industries

Consolidated sales of Canadian Industries Ltd. and subsidiaries in 1959 totalled $148,995,000 ($140,756,000). Income from operations amounted to $13,801,000 ($9,723,000). Net income was $6,246,000 ($5,170,000).

Income from operations was 42% above the previous year, in spite of higher depreciation charges and the increased investment in building and equipment, and costs associated with the start-up of the expanded Edmonton polythene plant, the capacity of which was doubled.

Sales of Terylene rose considerably, while ammonia output at Millhaven, Ont., was more than double. Sales of acids for the processing of uranium ores were higher, but the future of this business may be affected by a change in the terms of Government contracts with the uranium producers.

Du Pont of Canada

Sales of $90,921,000 ($81,680,000) are reported by Du Pont of Canada for 1959. Net income was $7,169,000 ($5,235,000). Expenditure on plant construction was $10,374,000.

U.S. Reports

Bristol-Myers Co. report a 1959 profit of nearly $9 million, or some 16% above 1958. In the last quarter of the year profits were 30% above the same period of 1958.

Carter Products Inc., pharmaceutical producers, announce that in the last three quarters of 1959 their profit totalled $7.3 million dollars, or some 40% more than in the same nine months of 1958.

Chemstrand Corporation, U.S., report 1959 sales of just over $197 million, with a consolidated net income of more than $24 million, a 31% increase over the 1958 figure. In 1959 acrylic fibre plants were commissioned by Chemstrand Ltd. at Coleraine, and in Japan and Italy by affiliated companies. An expansion programme includes a new nylon plant in South Carolina, a nylon development centre at Pensacola, Florida, and a research centre in North Carolina.

Despite the bad influence of the steel strike in the last quarter of last year, the **Monsanto Chemical Co.** announce that their 1959 turnover totalled $811 million ($714 million), while profits rose over the year from $42.9 million to $61.7 million. These figures contain the results of U.S. and foreign subsidiary companies in which Monsanto have more than 50% holdings. 1959 was a record year for foreign subsidiaries and dividend payments to the parent company totalled $4.3 million. With the one exception of Monsanto Boussois, the French subsidiary, all overseas companies increased their turnovers, particularly Mitsubishi Monsanto, Japan.

The 1959 turnover of the **Stauffer Chemical Co.** was, at $229 million, higher by 8% than in 1958. Profits for the year were up as much as 23% on 1958 at $22 million.

Union Carbide Corporation state that last year total sales amounted to some $1,531 million ($1,297 million). Net profit for 1959 was $172 million ($125 million). The 1959 result is a record for the Corporation. A further increase in turnover and profits is said to be likely for 1960.

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TRADE NOTES

Eltesol Hydrotopes

A new leaflet is available from Marchon Products Ltd., Whitehaven, Cumberland, dealing with Eltesol hydrotropes, a series of aromatic sulphonates for use in the detergent field as coupling agents and solubilisers. They will also reduce the consistency of slurries and have many applications as a result of this property. The grades in the range are sodium xylene sulphonate, sodium toluene sulphonate, potassium xylene sulphonate and potassium toluene sulphonate.

Impalco Treadplate

Impalco aluminium alloy treadplate with non-slip surfacing is the subject of a new leaflet available from Imperial Aluminium Co. Ltd., P.O. Box 216, Witton, Birmingham 6, or from I.C.I. sales offices.

Transistor Applications

Newmarket Transistors Ltd., Exning Road, Newmarket, have produced a series of application notes covering a wide range of applications, including audio amplifiers, transistor regulated power supplies, d.c./d.c. and d.c./a.c. convertors, R.F. oscillators and low current relay drivers, etc.

New Fisons Products

Among new products to be introduced by Fisons Horticulture Ltd. in March and April is a new hedge setter to check upward and outward growth. This is based on maleic hydrazide and marks the culmination of years of research. Fisons spot weeder is a new type aerosol for the spot treatment of isolated patches of weeds on lawns; it contains Ridweed (2:4-D and 2.4:5-T).

Wiggin Nickel Alloys

A nickel-alloys-in-industry exhibition is to be staged by Henry Wiggin and Co. Ltd., Thames House, Millbank, London S.W.1, at 45 Park Lane, London W.1, from 21 to 25 March, to help engineers and designers to make best use of the specialised Wiggin alloys. Lectures will be given on the fabrication of high-nickel alloys and the uses of high-nickel and nickel-base alloys in heat-resisting applications, in chemical engineering, etc.

Ready-for-Use Gel Coat System

A new premixed gel coat system based on high quality general purpose polyester resins has been introduced by Bakelite Ltd., 12-18 Grosvenor Gardens, London S.W.1, as Bakelite resin DSR.19142. The use of DSR.19142 is said to avoid the time and money consuming operation of making small quantities of gel coat mixes, and eliminates the necessity of having to dilute thixotropic concentrates.

Cawley Plastics

Cawley Plastics Ltd., Wey Lock Works, Byfleet Road, New Haw, Weybridge, Surrey, are changing their name on 1 March to Tough Plastics Ltd., and will continue to serve industry in the corrosion engineering field. The change is being made due to persistent confusion between the name 'Cawley' and the town of Crawley and the choice was influenced by the success of the company's trade mark 'Tufplas'.

DIARY DATES

MONDAY 22 FEBRUARY

C.S.—Durham: Science Laboratories, South Rd., 5 p.m. 'Tilden Lecture: 'Hydrocarbon-metal carbonyls', by Prof. P. L. Pauson.

Inst. Rubber Ind.—Manchester: Engineers' Club, Albert Sq., 6.45 p.m. 'Towards the quantitative understanding of rubbers', by Prof. G. Dee.

R.I.C.—Stockport: College of Further Education, Wellington Road South, 6.30 p.m. 'Radiation chemistry of organic substances', by Prof. F. S. Dainton.

TUESDAY 23 FEBRUARY

C.S. with R.I.C.—Nottingham: Chemistry Dept., University, 8 p.m. 'Developments in study of electrophilic substitution', by Sir Christopher Ingold.

C.S.—Manchester: Large Lecture Theatre, Chemistry Dept., University, 6.30 p.m. Centenary Lecture: 'Some glimpses into variations which nature brings about in acetylenic compounds', by Prof. N. A. Sorensen.

I.Chem.E.—London: Burlington Hse., Piccadilly, W.1, 5.30 p.m. 'Vibratory ball-mills', by H. E. Rose.

WEDNESDAY 24 FEBRUARY

B.A.C.—London: Symposium on 'Salaries and conditions for chemists in industry'.

O.C.C.A.—London: Manson Hse., 26 Portland Pl., W.1, 7 p.m. 'Penetration of non-aqueous liquids into paper, under pressure'.

S.A.C. with R.I.C.—Birmingham: Dept. of Chemistry, University, 7 p.m. 'Some analytical aspects of reactions in certain non-aqueous solutions', by Prof. V. Gutmann.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.15 p.m. 'Chemical sterilants in the food industry', by G. A. Thomas, etc.

THURSDAY 25 FEBRUARY

C.S.—Aberystwyth: Edward Davies Chemical Labs., University College, 5 p.m. 'Molecular structure of benzene', by Dr. D. H. Whiffen.

C.S.—Bristol: Dept. of Chemistry, University, 5.15 p.m. 'Nuclear magnetic resonance', by Dr. R. E. Richards.

C.S.—Hull: Organic Lecture Theatre, Chemistry Dept., University, 5 p.m. 'Anthraquinone chemistry', by Dr. S. Coffey.

C.S.—Leeds: Chemistry Lecture Theatre, University, 6.30 p.m. 'Developments in study of electrophilic substitution', by Sir C. Ingold.

C.S.—Liverpool: Dept. of Inorganic and Physical Chemistry, University, 5 p.m. 'Chemotherapy', by Dr. F. L. Rose.

C.S.—London: Large Chemistry Lecture Theatre, Imperial College, S.W.7, 7.30 p.m. Centenary Lecture: 'Some glimpses into variations which nature brings about in acetylenic compounds', by Prof. N. A. Sorensen.

Fertiliser Soc.—London: Burlington Hse., Piccadilly, W.1, 2.30 p.m. 'Modern techniques in application of fertilisers', by P. Hebblethwaite.

R.S.—London: Burlington Hse., Piccadilly, W.1, 4.30 p.m. Ordinary meeting.

S.C.I.—Dundee: Chemistry Lecture Theatre, Queen's College, 7.15 p.m. 'Optical rotatory dispersion in structural and stereochemical studies', by Dr. W. Klyne.

FRIDAY 26 FEBRUARY

C.S.—Cambridge: University Chemical Laboratory: Lensfield Rd., 8.30 p.m. 'Alkali-metal derivatives of organic and organometallic compounds', by Prof. G. E. Coates.

C.S.—St. Andrews': Chemistry Dept., St. Salvators College, 5.15 p.m. 'Chemistry of poisoning', by Dr. A. S. Curry.

C.S.—Newcastle upon Tyne: Chemistry Dept., King's College, 5.30 p.m. Bedson Club Lecture: 'Complexometric titrations', by Dr. H. M. N. H. Irving.

S.A.C.—Glasgow: Central Hotel, 7.15 p.m. 'Analytical methods in hygienic control of industrial atmospheres', by Dr. J. C. Gage; 'Analytical problems in isolation and measurement of traces of radioactivity in foodstuffs', by Prof. J. Hawthorn.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 23 March

Resins. U.S. Rubber Co. **831 246**
Gas analysis. Maihak, AG, H. **831 039**
Upgrading crude petroleum oils. Esso Research & Engineering Co. **831 247**
Propellant for rockets and other jet engines. Heyl, W. [trading as Heyl & Co. Chemisch-Pharmazeutische Fabrik]. **831 103**
Production of isoprene and other olefins. Pechiney Compagnie. **831 249**
Production of acetylene by thermal cracking of hydrocarbons. Badische Anilin- & Soda-Fabrik AG. **831 105**
Production of alkylaluminium sesquichlorides. Chemische Werke Hüls AG. [Divided out of 831 267.] **830 884**
Cyclo-octylamine derivatives and their production. Badische Anilin- & Soda-Fabrik AG. **831 185**
Preparation of carboxylic compounds. Pittsburgh Coke & Chemical Co. **830 886**
Solvent dewaxing plant with unitary compressor. Esso Research & Engineering Co. **831 108**
Isomerisation of paraffin hydrocarbons. Esso Research & Engineering Co. **830 891**
Coated polyester film. Winterbottom Book Cloth Co. Ltd. [Divided out of 822 894.] **830 777 & 830 778**
Preparation of monothiooxamide. American Cyanamid Co. [Divided out of 831 001.] **831 002**
Benzene sulphonyl ureas. Boehringer & Soehne GmbH, C. F. [Divided out of and addition to 831 043.] **831 044**
Substituted phenols. Merck & Co. Inc. [Divided out of 830 821.] **830 822**
Catalyst systems for polymerisation of unsaturated compounds. Imperial Chemical Industries Ltd. [Divided out of 821 142.] **830 893**

Open to public inspection 30 March

Refining of heavy metals by zone melting. Associated Electrical Industries Ltd. **831 305**
Reaction products of polyesters with polyisocyanates or polyisothiocyanates. Dunlop Rubber Co. Ltd. **831 301**
Reaction products of polymers with polyisocyanates or polyisothiocyanates. Dunlop Rubber Co. Ltd. **831 302**
Process for carrying out endothermic reactions at high temperatures. Knapsack-Griesham AG. **831 522**
Production of addition products from aluminium hydrocarbons and acetylene or acetylene derivatives. Ziegler, K. **831 328**
Method of packing liquid or pasty goods in hard foils of artificial thermoplastic material. Farbwerke Hoechst AG. **831 310**
α, α - Bis (chlorophenyl) alkanols. Metal & Thermit Corp. **831 421**
Process for chemically refining hydrocarbons. Sager, F. **831 530**
Process for eliminating carbon dioxide contained in gases. Soc. Pour l'Equipement Des Industries Chimiques—S.P.E.C.H.I.M.—Reunion Des Anciens Etablissements Barbet, Agrot & Grange Pingris & Mollet-Fontaine, and Guinot, H. M. **831 532**
Organosilanes. Metal & Thermit Corp. **831 422**
Method of coating molybdenum and its alloys for protection against oxidation at elevated temperatures. General Electric Co. **831 786**
Production of solid polyethylenes. Roumanian Ministry for the Chemical Industry, Director of. **831 787**
Process for manufacture of pyridine and quinoline carboxylic acids. Ciba Ltd. **831 561**
Pesticidal compositions. Lunevale Products Ltd., and Fitzgibbon, M. [Cognate application 12 607.] **831 790**
Continuous olefin polymerisation process. Esso Research & Engineering Co. **831 279**
Refining processes for semiconductor and other materials. Standard Telephones & Cables Ltd. [Addition to 831 303.] **831 304**
Diagnostic compositions. Miles Laboratories Inc. **831 804**
Process and catalyst for production of olefin polymers. Phillips Petroleum Co. **831 806**
Process and apparatus for producing a combustible gas from volatile liquid fuels, particularly gasoline. Correa, E. **831 280**
Apparatus for cooling granular materials and particularly for cooling moulding sand. Junkerather Gewerkschaft. **831 340**
Production of styrene compounds. Dow Chemical Co. **831 429**
Radioactive tracers. Esso Research & Engineering Co. **831 382**
Liquid-liquid contacting apparatus. U.K. Atomic Energy Authority **831 383**
Symmetrical indigoid dyestuffs and process for their manufacture. Ciba Ltd. **831 810**
Melting down metals in an arc. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **831 431**
Agricultural chemical compositions. Fisons Pest Control Ltd. **831 344**
Substituted piperidines. Imperial Chemical Industries Ltd. **831 345**
Organic aluminium compounds. Hardman & Holden Ltd. **831 346**
Apparatus for the granulation of crude cement dust and other materials. Zementanlagenbau Dessau Veb. **827 232**
Treatment of polymers. Imperial Chemical Industries Ltd. **831 347**
Thermal diffusion process. British Petroleum Co. Ltd. **831 821**
Method of preparing dehydrated aldols of high molecular weight. Armour & Co. **831 823**
Magnetic separators for fluent materials. Blending Machine Co. Ltd. **831 287**
Preparation of monosilane. Union Carbide Corp. **831 289**
Evaporators. Weir Ltd., G. & J. **831 478**
Production of cyclopolyolefins. Badische Anilin- & Soda-Fabrik AG. **831 350**
Stabilised oil extended rubber compositions. Bataafsche Petroleum Maatschappij N.V., De. **831 448**
Production of sulphur dioxides. Kestner Evaporator & Engineering Co. Ltd. **831 570**
Production of azulenes. Studiengesellschaft Kohle. **831 575**
Process for the recovery of dissolved metal valves. Little Inc., A. D. **831 745**
Olefin polymerisation process. Phillips Petroleum Co. **831 581**
Production of preforms and longitudinally curved articles of polytetrafluoroethylene resin. Resistoflex Corp. **831 754**
Preparation of 3:3¹ 5:5¹-tetraalkyldiphenoquinones. Ethyl Corp. **831 356**
Methods and apparatus for drying grain or other granular material. Willans, K. W. [Cognate application 440.] **831 623**
Purification of isoprene. Gulf Research & Development Co. **831 357**
Catalysed halogenation of polyolefins. Dow Chemical Co. **831 358**
Production of silicon. Monsanto Chemicals Ltd. **831 359**
Water-dispersible carotenoid compositions and process for manufacture thereof. Hoffman-La Roche & Co. AG., F. **831 765**
Radiolytic polymerisation of cyclopentadiene. Esso Research & Engineering Co. **831 319**
Apparatus for separating fluids under pressure such as fluid pressure accumulators. Mercier, J. **831 363**
Slurry removal system. U.S. Borax & Chemical Corp. **831 397**
Monomeric polymerisable ureido and thio-ureido compounds, methods for producing them and polymers. Rohm & Haas Co. [Divided out of 822 267.] [Addition to 761 901.] **831 635**
Glutaconimides and their process of preparation. Chimie Et Atomistique. **831 366**
Unsaturated sultams. Farbenfabriken Bayer AG. **831 400**
Apparatus and method for continuously determining viscosity. Texaco Development Corp. **831 775**
Apparatus for extracting liquid from liquid-containg material. Hetzler, J. J. H. M. **831 376**
Hydrogenation of acetylene. Engelhard Industries Inc. **831 406**
Purification of aluminous metal. Aluminum Co. of America. **831 637**
Magnesium-base alloy. Dow Chemical Co. **831 638**
Cooling of aluminium oxide or similar material produced in a rotary kiln and kilns equipped with coolers. Smith & Co. A.S., F. L. **831 413**
Production of cyclo-octatetraene. Badische Anilin- & Soda-Fabrik AG. **831 414**
Refining of lead. Du Pont De Nemours & Co., E. I. **831 418**
Thiocyanic esters and pesticidal compositions containing them. Soc. Des Usines Chimiques Rhone-Poulenc. **831 420**
Stabilisation of alcohols and esters. Bataafsche Petroleum Maatschappij N.V., De. **831 592**

Open to public inspection 6 April

Methods of separating plutonium. Heal, H. G. **831 862**
Articles of reinforced silicone elastomers. Rolls-Royce Ltd. **831 863**
Curing agents for epoxide resins. Leicester, Lovell & Co. Ltd. (Borden Co. Inc.). **832 188 & 832 189**
Production of metals by electrolysis. U.K. Atomic Energy Authority. **832 190**
Preparation of polymeric mixtures and compounds. British Rubber Producers Research Assoc. **832 193**
Electrodeposition of metals. Geigy & Co. Ltd. **832 062**
Electrolyte processes. Billiter, J. **832 196**
Multi-colour printing on hard foils of polyvinyl chloride. Farbwerke Hoechst AG. **832 348**
Amides. May & Baker Ltd. **832 183**
Inhibiting corrosion in metals. Boake, Roberts & Co. Ltd. [Cognate application 8 540.] **832 064**
Metal complexes of benzene-azo-pyrazolone compounds and materials dyed therewith. Eastman Kodak Co. **832 199**
Production of alumina hydrate compositions. Engelhard Industries Inc. [Addition to 735 390.] **832 200**
Continuous flow electrophoresis. Bier, M. **832 202**
Water-soluble melamine-formaldehyde condensation polymers. American Cyanamide Co. **832 203**
Polymerisation of olefins. Bataafsche Petroleum Maatschappij N.V., De. **832 204**
Reaction products of complex metal compounds of mono-azo-dyestuffs with basic dystuffs and process for their manufacture. Ciba Ltd. **832 206**
Polymerisation of mono-olefins. Petrochemicals Ltd. **832 205**
Manufacture of shaped structures such as filaments or foils from high-melting linear polyesters. Farbwerke Hoechst AG. **831 961**

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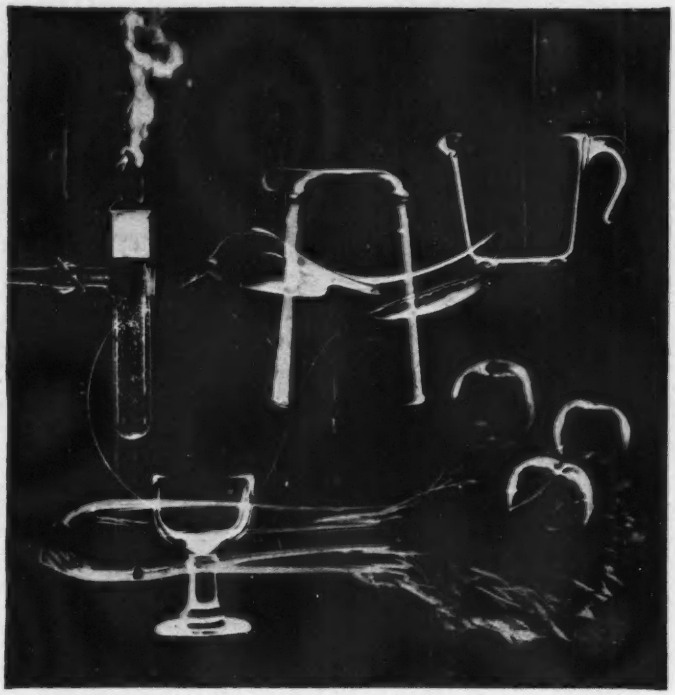

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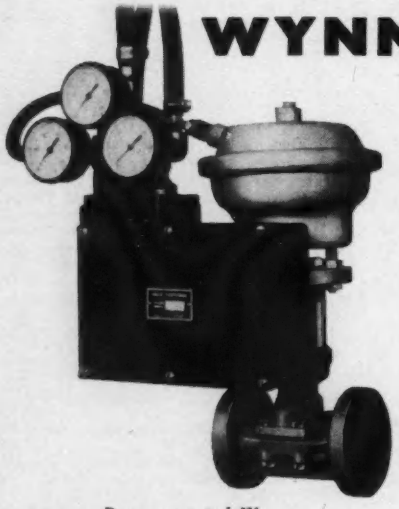

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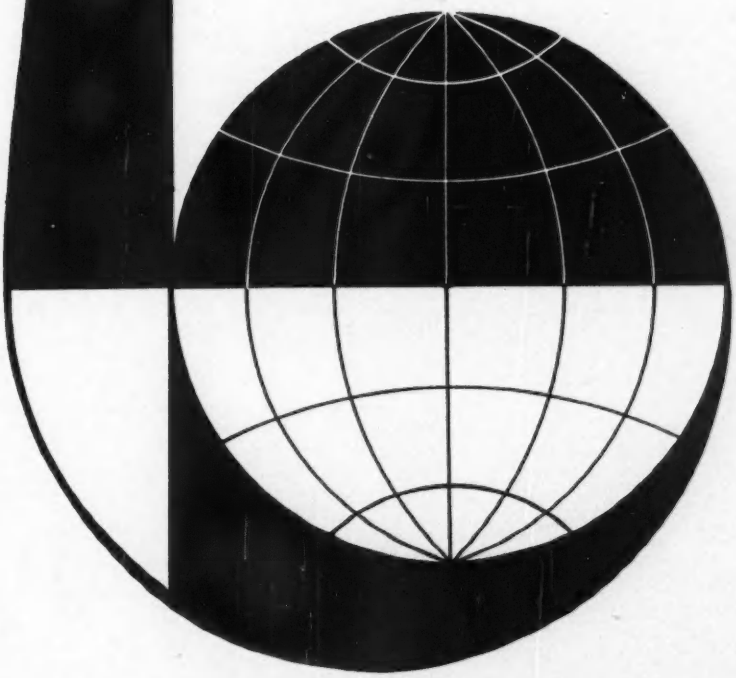

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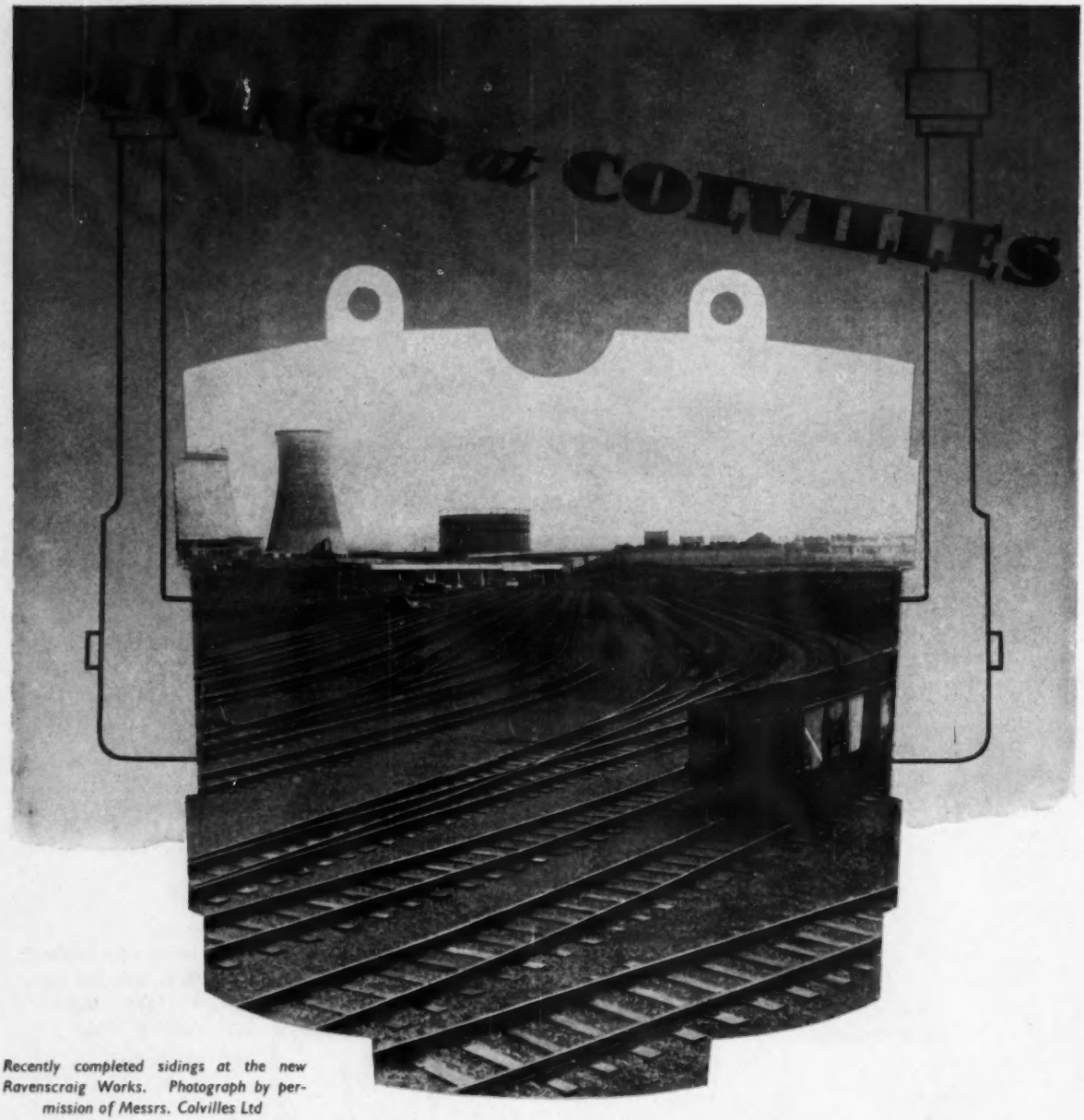

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